

# AVIATION

*The Oldest American Aeronautical Magazine*

SEPTEMBER 26, 1927

Issued Weekly

PRICE 15 CENTS



The new Ford experimental "air fliver" racing the world's fastest speedboat "Miss America V"

VOLUME  
XXIII

## SPECIAL FEATURES

NUMBER  
13

THE "VILLE DE PARIS"  
AIR COOLED ENGINE DEVELOPMENT  
WRIGHT WHIRLWIND ENGINE PRODUCTION

AVIATION PUBLISHING CORPORATION

Editorial and Business Offices  
250 WEST 57 STREET, NEW YORK

Publication Office  
HIGHLAND, N. Y.

Entered as Second-Class Matter, Nov. 22, 1920, at the Post Office, at Highland, N. Y.,  
under Act of March 3, 1879



THIS MARK ✧

## Half the parts...

SIMPLICITY and reliability go together in aircraft engines. The Fairchild Caminez Engine is simple almost beyond belief. It has less than half the number of parts of other engines... has no timing gears or counter-weights... no bearings depending on lubrication pressures... and yet has the highly efficient half speed propeller without the use of reduction gears. Ralph Lockwood, of the U. S. Department of Commerce, pilot of the Curtiss Flying Service, Army and Navy pilots, pilots of the Air Mail, Mr. Brukner, manufacturer of Waco planes, in fact everyone, who flew and inspected the Fairchild Caminez Engine, was amazed at its simplicity. This simplicity, combined with Fairchild Caminez refinement in design and manufacturing methods, will go a long way toward establishing new records for reliability and ease of maintenance. The manufacturer of your present plane can supply you with a Fairchild Caminez motor installation.

The Fairchild Caminez Engine Corp. is a subsidiary of the FAIRCHILD AVIATION CORP. Its products, like all Fairchild Aviation products, are thoroughly engineered and tested, efficiently manufactured and are backed with a service that



has made Fairchild Aviation one of the eight largest organizations in the aviation industry.

Fairchild Caminez Engines were flown in April, 1936, and since then have been thru a strenuous series of flight tests and endurance runs, so there could be no question of their reliability. In July, 1937, a Model 447 H Fairchild Caminez Engine passed its 50-hour test, running the last 27 hours non-stop. As a result of the test it was approved as airworthy by the U. S. Department of Commerce, the first engine to be approved. Production engines are now being delivered. Fairchild Caminez Engine Corporation, Factory and Sales Offices, Farmingdale, L. I., N. Y.

# FAIRCHILD CAMINEZ

PRICE **2480** F. O. B.

✧ This trade mark represents the determination of a 7-year-old organization to build the best air machines.  
THE FAIRCHILD AVIATION CORPORATION

## The Ford monoplane is built for comfort



THREE engines for reliability; fireproof all-metal construction for strength, long life and low upkeep; brakes on the wheels for real control on the ground; these and many other advanced mechanical features transformed the Ford monoplane into both operators and pilots.

But the day is passing when safe and rapid flight alone are sufficient to offer to passengers—if indeed it has not already passed. The factor that will attract the general public to flying is the comfort of quiet outland-flying.

People will always use airplanes where time is vital. But compare the number of people who want luxury, to the total number of people who travel. A small percentage! The big market for passenger service is the public who will fly in preference to using other means of transportation—just because

emergency exists. The source of this preference must be comfort.

The Ford monoplane has been built for this market—and comfort has been considered with the same care as has been given structural strength and operating economy. The entire fuselage is enclosed. Flow of windows permit good visibility and ventilation. The fuselage is below the wing—lowering the center of gravity, widening the view and sheltering passengers from the sea. Exhaust manifolds throw the sound away from the fuselage—and padding of the compartment further muffles it. Conversation

can be carried on easily. Large upholstered chairs never riding over for 12 passengers. Lights are provided for night flying. The cabin is heated. Each plane is equipped with a lavatory and washstand. There is an observation room for food. These indicate the extent to which comfort has been built into the Ford monoplane.

Our booklet—"The New Era of Transportation"—gives a detailed account of the features of the Ford plane which are designed to provide the comfort that will insure public preference for travel by air. This is in addition to much valuable information of interest to operators on the construction of Ford planes and operation of airplanes. It will be sent at your request.

The SPERRY METAL AIRPLANE CO.  
Division of Ford Motor Company  
Dearborn, Michigan

# A complete guide to the industry . . .



Paper bound (illustrated above), \$1.00. Cloth bound, \$1.00.

Your copy of the American Aircraft Directory is ready for mailing. The American Aircraft Directory answers accurately and quickly the thousand and one questions which break in on busy days and which if answered at all, are so wasteful of time, efficiency and money.

Here, between two covers, is irrefutable and accessible information for aircraft executives, sales and purchasing officers, chambers of commerce, Aero Clubs, technical societies, schools and libraries; writers and editors, and everyone seeking facts regarding American aviation. Here is a mailing list such as every live sales manager has long desired for covering the whole aviation field.

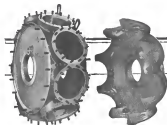
A comprehensive guide by states, cities and towns of organizations, companies,

products, officers and activities, also a trade directory by products. Among other things covered are: national and state air laws, commercial pilots and operating companies, sportsman fleets, graduate aeronautical engineers, manufacturers and dealers of airplanes, motors, parts and materials; officers and managers of airlines, accessory and operating companies, together with their products or activities; principal offices of national, state and local Aero organizations; personnel of the U. S. governmental departments having to do with procurement and supervision of government airplanes and their operations. It contains numerous photographs and other illustrations. Send for your copy today.

Aviation Publishing Corporation  
250 West 57th Street, New York City

Send in address below \_\_\_\_\_ copies of the American Aircraft Directory;  
\_\_\_\_\_ cloth bound at \$1.00; \_\_\_\_\_ paper bound at \$1.00, for which send  
remittance of \$ \_\_\_\_\_

## AMERICAN AIRCRAFT DIRECTORY



## Wasp & Hornet Leadership

- One piece Master Connecting Rod and Bolt-  
up Crankshaft +
- Divided and Forged Aluminum Main Crank-  
case +
- Grouping of all accessories at the rear of the  
engine +
- Complete enclosure of all working parts

## Forged and Divided Aluminum Main Crankcase

**The Wasp**  
425 H.P.  
at 1900 R.P.M.  
Weight 670 lbs.

**The Hornet**  
525 H.P.  
at 1900 R.P.M.  
Weight 770 lbs.

Pratt & Whitney engines feature a forged instead of cast aluminum main crankcase, consisting of two identical pieces facing each other and held together by nine through bolts, one between each two cylinders.

The forging increases the strength two-fold and eliminates the danger of casting defects. The design divides the load equally between the two main bearings and provides rigid crankshaft support.

This basic feature in both the "Wasp" and the "Hornet" has paved the way for high powered, big displacement air-cooled radials and is making possible the broad application of this type of engine.



THE  
**PRATT & WHITNEY AIRCRAFT CO.**  
HARTFORD, CONNECTICUT

## DEPENDABLE ENGINES

# CHANGE IN PRICE

WITH THE NEXT ISSUE  
OCTOBER 3rd

THE PRICE OF

**AVIATION**

will be

**20 CENTS**

THE YEARLY SUBSCRIPTION PRICES \$4 U. S. AND POSSESSIONS,  
\$5 CANADA AND \$6 ALL OTHER COUNTRIES  
WILL REMAIN THE SAME.

AVIATION PUBLISHING CORPORATION  
250 W. 57th St.  
NEW YORK CITY

**Increased Flying Safety  
Increased Safe Flying Life  
Reduction to Minimum of  
Forced Landings  
Decreased Cost of Operation**

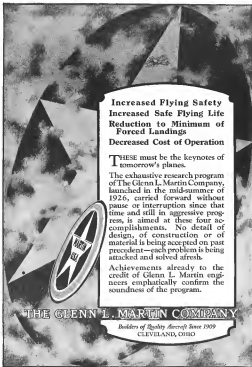
THESE must be the keynotes of tomorrow's planes.

The exhaustive research program of The Glenn L. Martin Company, launched in the mid-summer of 1926, carried forward without pause or interruption since that time and still in aggressive progress, is aimed at these four accomplishments. No detail of design, of construction or of material is being accepted on past precedent—each problem is being attacked and solved afresh.

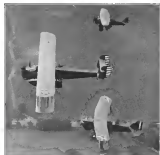
Achievements already to the credit of Glenn L. Martin engineers emphatically confirm the soundness of the program.

**THE GLENN L. MARTIN COMPANY**

*Builders of Quality Aircraft Since 1909*  
CLEVELAND, OHIO



## THREE GREAT CURTISS MILITARY AEROPLANES



"HAWK" Standard Pursuit type of the U. S. Army Air Corps.

"FALCON" Standard Observation and Attack type of the U. S. Army Air Corps.

And now —

"CONDOR" The latest development in bombing aeroplanes for the Air Corps. Developed under the Curtiss system of Group Engineering, in cooperation with Air Corps experts, and already credited, in preliminary tests, with a performance far surpassing standard types.

THE CURTISS AEROPLANE & MOTOR CO., Inc.

Offices: Garden City, N. Y. Factories: Garden City and Buffalo, N. Y.



# ART GOEBEL WON WITH PHILLIPS Gasoline



The above message was sent by Art Goebel and pilot for the Phillips Petroleum Company, both in race ship.

The high quality and absolute dependability of the PHILLIPS Aviation Gasoline used by Art Goebel in his victorious flight in the "Woolac" from San Francisco to Honolulu is characteristic of all Phillips natural gasoline products.

PHILLIPS PETROLEUM COMPANY  
Bartlesville, Oklahoma

# PHILLIPS

Aviation Gasoline

# WORCESTER AIR PAGEANT

*Largest Air Meet Ever Attempted in New England*

THE OFFICIAL DEDICATION OF  
WORCESTER'S \$75,000 AIRPORT

**Saturday, October 8, 1927**

North Grafton, Mass.

Complete Air Program and Passenger Carrying

**PRIZES — \$2500.**

FREE GAS AND OIL TO ALL CONTESTANTS  
FREE FOOD AND ACCOMMODATION

For full information, address:  
**JAMES P. WHITTALL**  
Chairman Worcester Air Pageant Committee  
Box 87, WORCESTER, MASS.

# AVIATION

EARL D. GARDNER  
President and Editor

LESTER D. GARDNER  
Editor

GEORGE NEWELL  
Business Manager

AVIATION PUBLISHING CORP.  
Business and Editorial Offices—230 W. 37th St., New York

Cable Address—AEROSOL  
Publication Office—Hightstown, N. Y.

R. SHERMAN DODGE, Jr., Managing Editor

ROBERT H. MOORE  
Technical Editor

ALBERT F. MULLER  
Assistant Editor

L. D. WILSON  
Treasurer

Vol. XXIII SEPTEMBER 26, 1927

No. 13

## Index to Contents

### NEWS ARTICLES AND ITEMS

Royal Mounted Police Use Ryan Brougham	722
Williams to Try for Land Plane Speed Mark	722
U. S. Holds 29 of 32 Air Records	724
The West Birds Hold Annual Meeting	725
America Wins Gordon Bennett Balloon Race	726
New Flyers Pilot FN-10 Plane to 6075 Ft.	727
Plane for West Indian Service	727

### FEATURES AND DEPARTMENTS

Editorial	717
The "Ville de Paris"	718
Air Cooled Engine Development	723
Wright Wheelwind Engine Production	727
Aircraft Trade Notes	728
The Makins "Super Monoplane"	729
Side Slips	730
Airports and Airways	732
Publisher's New Letter	733

WHERE TO FLY 716-718

AIRCRAFT SERVICE DIRECTORY 716-717-718

CLASSIFIED ADVERTISING 730

ADVERTISING INDEX 731

Subscriptions, prices: Five dollars per year. Single copies, 10 cents. Payment in advance. Single copies, 10 cents. New year, 10 cents. Single copies, 10 cents. Advertisers send no application.

Send every Monday. Please show this date previously. Editor at 230 W. 37th St., New York. Post Office at Hightstown, N. Y., established April 8, 1927.

Copyright 1927 by Aviation Publishing Corp.

### With the Editor

On page 718 of this issue of AVIATION is to be found a complete technical description of the "Ville de Paris", the new Sikorsky plane, model S-22. The plane was originally constructed for a contemplated New York to Paris non-stop flight by the French armée, Capt. René Focke and Lieutenant Curtis, U.S.N., but due to present public opinion in France—concerning flights to trans-oceanic flights the project was abandoned. For a time it was believed that Captain Focke would enter the plane in the New York to Spokane non-stop race. According to latest reports an announcement is soon to be made by Captain Focke regarding definite plans for a long flight.

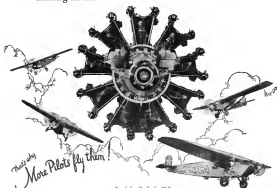
Briefly, Model S-22 is an all-metal monoplane of open work construction and is powered with two Grasse-Rhone Japayer engines, though two Pratt & Whitney "Hornet" may be used. The plane is characteristic of Sikorsky construction and the cabin, with windows the entire length, is fitted with armchairs seating 11 to 12 persons.

# CONFIDENCE!

Lindbergh, Chamberlin, Maitland, Byrd, Smith, Goebel and Jensen placed their confidence in the Wright Whirlwind engine—and astounded the world by their achievements.

Less spectacular, but equally significant, is the selection of this same engine by twelve out of fourteen entries in the Third National Air Tour for the Ford Trophy, in which Wright Whirlwind engines again won first and second places.

Public confidence in modern American aircraft powered with this proven engine is founded on a long record of unflinching service.



Send for Bulletin 17R

# WRIGHT

AERONAUTICAL CORPORATION

Paterson, N. J., U. S. A.



Vol. XXIII

SEPTEMBER 26, 1927

No. 13

## Blind Flying Development

IT IS becoming increasingly obvious to both pilots and laymen that the human senses alone can not be entirely relied upon to keep a plane on a straight and level course when the pilot loses his horizon as is done when flying through fog. So far the nearest solution of the problem has come through training pilots to use instruments which when properly interpreted will give the pilot an artificial horizon. Such instruments have been developed to an extraordinary degree and the Fly-over Instrument Co. deserves great credit for the work which it has done in this direction. Yet, however perfect the instruments may be they still have to be interpreted by the pilot and this interpretation is often doubly difficult because the instruments often will indicate that the controls should be moved in a certain way, whereas the pilot's sense of "feel," on which he has been trained to rely in ordinary flying, will indicate that the controls should be moved in the opposite direction.

The next step in the development of "blind flying" is obviously the interconnection of the instruments directly with the controls, thus eliminating the interpretation of the pilot. Although much work has been done on this subject, and though periodic announcements have been made that automatic stability has been achieved, it must be admitted that the machines have been theoretical and have not become sufficiently perfected to warrant their use on air lines. However, with the increasing range and reliability of planes it has become imperative to be able to fly blind for at least part of the route and the development of a practical apparatus for ensuring automatic stability should not be long in coming.

## "Unanimously Carried"

PRONUNCIATION of aeronautical English has always caused difficulty for those who wish to appear to have some knowledge of the art. The pronunciation of the word aviation as a-v-i-a-t-i-o-n, with an accent on the 'i' here, instead of a-v-i-a-t-i-o-n, with both a's silent, immediately stamps the speaker as belonging to the aviators who have no report for good usage.

But it appears that the word completely changed that American pronunciation has made has been in England. The British Broadcasting Company's Advisory Committee on Spoken English has just published its second list of pronunciations for broadcast. In this volume are such domestic English words as Robert Bridges, the poet laureate, George Bernard Shaw, L.

Pearson Smith, Sir Johnson Forbes-Robertson, Prof. David Jones and A. Lloyd James. The recommendations are as follows:

Aerial—First syllable of name to be pronounced as, the adjective to be aerial.

Aeroplane—First syllable to be pronounced air- (The use of the term airplane abandoned.)

The last recommendation is the particular point to be observed. For many years the suggestion of the use of the word "airplane" by the National Advisory Committee for Aeronautics in its nomenclature was received with stout respect, and even such papers as The Saturday Evening Post to be still more stubborn convinced to use airplane with the two dots over the e. The English, up to now, have clung to the old word, and it is not certain now that the suggestion of the Committee will be followed, but with the aviators using the preferred word it may not be long before airplane replaces, as it should, the awkward aeroplane that is so difficult to pronounce.

## Well Done, Schlee and Brock!

IN VIEW of the fact that for the time being public and expert opinion is very much adverse to transoceanic flying, Edward F. Schlee and William S. Brock have unashamedly won higher credit in the eyes of the world at large by abandoning their round-the-world flight at Tokyo, Japan, than they would have gained even though they continued on to success. To them it must have been a bitter disappointment to stop when they were so near yet so far from their goal, and, added to that, had the faith and courage of their own countries that they would win. And for that reason alone they merit high praise for mortifying personal ambition for the happiness of others.

But the fact that they will cross the Pacific on a boat takes out one side of glory from their history-making flight. It will be recorded as one of the greatest aerial feats of all time and all those who were connected with it can be justly proud of the association. The performance of their Stinson-Deterville monoplane under such adverse weather conditions as the three reported so have encountered is a perfect tribute to the skill and brains of its manufacturers, the Stinson Aircraft Corp. And the 100 per cent service that the Wright Whirlwind engine rendered, not only in the transit but above the North Atlantic, but in the blistering heat of the tropics as well, adds another page of splendid achievement in the history of the Wright Aeronautical Corp.

# The "Ville de Paris"

New Sikorsky Plane, Model S-37, Built for Rene Foeuch, is an All-Metal Sesquiplane of Open Work Construction and is Powered With Two Gnome Rhone Jupiter 500 Hp. Engines

**A**FTER OVER eighteen years of experience, the last five of which have been in the United States with the Sikorsky Manufacturing Co. of College Point, N. Y., in the design and construction of multi-engine planes as well as present experience with heavy military bombing planes type S. Sikorsky has produced what is rated as being his greatest achievement of airplane design. His latest model, the S-37, is a large all metal sesquiplane of the long distance type. The first plane of this type to be completed (in the order of Rene Foeuch the French aviator) the "Ville de Paris" (City of Paris) is powered with two Gnome Rhone Jupiter 500 hp. engines through two Pratt and Whitney Hamilton type oil coolers. The plane is of all metal construction, using entirely open section structures with some solid fittings and struts. No welding or wood is used in any structural part. The cabin, with windows the entire length, is fitted with armchair seating 14 to 35 persons comfortably.

The plane is characterized by Sikorsky construction having a large upper wing of high aspect ratio and a small narrow lower wing, the latter being primarily a structural member supporting the center of strain and when necessary for loading the wings. These wings combine structural advantages such as rigidity, reliability due to the lightness with the aerodynamic efficiency of an uninterfered monoplane wing. The resistance of strain and stress in this type of plane is more than compensated by the advantages resulting from the possibility of using a very high aspect ratio and no vertical cut thicker than that required from the aerodynamic standpoint. These considerations were to be justified by the outstanding high performance of the latest Sikorsky plane, especially the S-37.

## Plane Weighs 8000 Lb. Empty

This plane which weighs 8,000 lb. empty has a normal loaded weight of 17,000 lb. at which 4,000 lb. is payload with a cruising radius of 3,000 mi. at 170 m.p.h. That is, the cruising speed is considered not requiring more than 75 per cent of the engine power. At the time of this writing, load and economy tests are being made to accurately determine these points. Preliminary endurance and reliability tests show that the S-37 has a maximum speed of 320 m.p.h. and a cruising speed of 175 m.p.h. with a useful load of 7,000 lb. With this load the climb of the ground is 400 ft. per min. and the ceiling is 16,000 ft. It has an exceptionally high gliding angle of climb to use.

The very high all around efficiency of the S-37 is due chief-



Top view and side profile of Model S-37

ly characteristic. With a wing loading of 13 to 15 lb. per sq. ft. the plane is perfectly unstreamlined and gives the impression of a lightly loaded craft. The aerodynamic is as easy as the use of a small light plane. With this same load and with only one engine running the plane is under perfect control and can fly without losing altitude. The efficient radial engine S-37-A developed by Sikorsky and used on the plane is of medium dimensions. The same characteristics of the engine are a good lift and a very high L/D on medium and high resistance. The high aspect ratio and the carefully studied general design of the plane together with qualities of the wing portion, use the main reason for the performance of the plane. The best L/D of the complete plane was found to be approximately 14 to 5 in 4 drop motion. The small chord of the wings—the upper wing only 100 in. and the lower wing only 60 in.—for a plane of 15,000 lb. normal gross weight reduces the bearing displacement of the center of pressure and in turn reduces the effect on the tail surfaces. Therefore, with a span of 180 ft. a comparatively short forelength of only 44 ft. and relatively small tail surfaces may be used. Although the forelength is very easy on the contrary the section of the silhouette is completely satisfactory, passengers are given about the same without any compromise to the pilot. In general the short forelength,



Front view of the new Sikorsky plane "Ville de Paris"

small tail surfaces and large but very narrow wings are completely satisfied by aerodynamic efficiency as well as stability and ease of control in flight.

The symmetrical parabolic of the section which, together with the corresponding position of the engine section, the pilot to maintain his course with only one engine running by anchoring the rudder in each direction, it is obvious that in case of failure of the right engine the center of the left rudder will give a negative yawing moment counteracting the positive yawing moment due to the asymmetry of the fuselage. This is of course in opposite from the other rudder, but the absence of the diphenon on that surface lowers the air speed and consequently reduces its effectiveness. The device is patented in the United States and 17 foreign countries.

In the design of the S-37 every possible measure was taken to provide reliability and safety and yet maintain a high performance. The plane was designed and built in accordance with load factors required by the U. S. Government Air Service for multi-engine. The aerodynamic was all based on a gross load of 18,000 lb. and in certain cases it was necessary to have even higher load factors than those required. For instance the tail surfaces and ailerons were calculated to stand a load of 15 lb. per sq. ft. These high load factors exceed the high structural weight of the plane which surpassed the conventional figure. The plane, open, less engine and propellers, has a weight of 6,000 lb. or 6.1 lb. per sq. ft. wing area. The wing chords, including all struts and wires weigh 22 lb. per sq. ft. and was designed to stand a normal load up to 270 lb. per sq. ft.

These figures show that the high performance of the plane is due to the use of a small amount of weight of structure or due to reduced load factors or either compromise. In fact it was just to the contrary, the plane is very sturdy and is many times in excess of the normal requirements.

## Rigid Construction Eliminates Vibration

The very rigid all metal construction with elimination of vibration increases safety and besides leading to the comfort of the passengers adds to the long life of the plane. The open structure indicates and is the construction of the wings and forelength of the plane represent a very valuable feature from the point of view of maintenance and inspection.

Due to the arrangement of the engine, air on each side of the fuselage (with the main fuel tanks in the fuselage) an exceptionally safe arrangement results as crew, passengers, and all vital parts of the plane such as control cables, tanks, etc. are located entirely out of the pieces of propeller rotation.

By thoroughly testing the wing and tail surface design, especially as to construction as well as wing tips with probably decreasing loadings, the tendency to breakaway tail spars were given is claimed to be entirely eliminated.

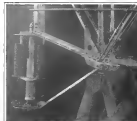
The forelength is divided into three main compartments; the baggage compartment in the nose, the control cockpit at the tail in front of the upper wing, and the passenger cabin taking the remainder of the fuselage except for a portion

at the rear. Behind the passenger, in the main compartment, is the main compartment.

If employed as a passenger transport the use of the fuselage can be used in many ways, it is one that the plane is to be employed for a long distance flight it can be used to house a large fuel tank. At the nose of fuselage is on hinges to serve as opening 30 ft. by 4 ft. large enough to permit the passage of a fair size truck into the fuselage.

The control compartment is equipped with dual side by side control. As an all Sikorsky plane of this type a single day control is used having a large dual control 10 ft. to be swung in front of either seat. By using two shifting levers, the control is easily moved over transforming the open cockpit into a completely closed cabin. The fixed position of the control serving is an additional advantage when the cockpit is open and offers a maximum of resistance with a measure of protection. The compartment is not directly or subject to disturbing air currents.

The pilot's seats are well cushioned and mounted on a sliding mechanism. The seat is supported by rubber shock and



Side view of the Sikorsky S-37

hold in any desired position by a catch operated with a lever. To raise the seat the catch is released and the support of the seat moves forward to the desired position allowing the seat to rise due to the tension of the rubber shock. When the seat is in the desired position the catch is engaged. To lower the seat the catch is released and weight of the seat-pedal slowly lowers the seat to the desired position.

The pedals are of the strap type with a very hard foot rest. By having the foot rest on a large section the strap the foot rest may be slipped over bringing it closer to the



Front view of the latest Sikorsky model.



post line providing for pilots of different stature. Both the pedals and the variable seat arrangement are standard Army provision on bombers.

Visibility is excellent both tops and aft. All controls are immediately arranged simplifying their operation. In the cockpit are located all of the navigational instruments and stabilizer adjustment wheel. The engine instruments, all gauges and all measurements, tachometers, etc. are located on the rear of the engine plate visible from the cockpit.

The compartment behind the central cockpit is 43 ft. by 6 ft. by 16 ft. All the place is to be used for passenger weight



Interior view instruments of the Ray.

It can comfortably seat 14 to 15 passengers. A feature of note found in long distance passenger planes is an under-tail cabin. In the 5.07 the main fuel tank is carried in this cabin behind each engine leaving the cabin practically clear except for a control panel for the fuel system at one side, just behind the cockpit. A small stairway connects the passenger cabin with pilot's compartment as the former is at a slightly lower level.

Windows 18 in. high, of Triplex safety glass, extend the entire length of the sides of the cabin giving the passengers a maximum of light and vision. Above and below the windows, the sides of the fuselage are paneled with Insulux. Wind tunneling the cabin from extreme temperatures. Both the roof and the floor are of plywood. There are two openings for ventilation purposes, one in the floor and the other in the ceiling. At the left side of the passenger's compartment is a door into the rear. At this door is approximately four feet above the ground a light, welded ladder is carried in the plane.

Behind the passenger, in the same compartment, is the radio apparatus. To the left is the transmission and receiving unit while to the right is the radio generator. The working for the latter is quite expensive, the generator is mounted on a spring-mounted set that when not in use it can be drawn into the fuselage out of the wind stream, thus reducing the wind resistance.

The fuselage members are entirely of duralumin. A combination of rivets and bolts is used, the latter being employed in only the main assembly and fittings. The vertical panels being of Warren truss type are connected by T section members above and below the cabin and by angles and the rods at the rear of the fuselage. However, in the cabin, the bracing is the upper horizontal panel is situated and the struts are reinforced by rigid steel which form the fitting and add to the load-carrying of the cabin. Behind the passenger's compartment the fabric is by means of a plywood material cut from steel cross bars. The side fitting consists of light duralumin members extending the length of the fuselage. These members serve at the same time as part of the waller frames.

The vertical panels and members are built up of members of two extruded duralumin angles riveted back to back and spaced by members. The diagonal members in the upper truss are tapered at the ribs. The horizontal panels are of extruded T section duralumin at the ribs and of extruded

duralumin angles at the rear reinforced by the ribs. All angles for members in the fuselage are in pairs being built into a T section spaced by members.

Around the fuselage at the rear is a duralumin angle panel, reinforced by bracing. The purpose of this member is to guide and support the rudder cables.

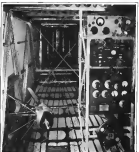
The method of spacing the duralumin angle simplifies the design of fuselage members. In most positions the fitting is merely a flat steel plate perforated or reinforced at the proper places. The flat plate is secured between the members of the vertical truss and held to the horizontal members by member nuts. At the forward portion of the fuselage these flat plates are reinforced by member plates in a vertical plane but perpendicular to the flat plate. At these points all connections are made by bolts, while the angles are assembled with rivets.

The truss described above, in addition to two metal tubes at the front of the fuselage, ensures torsional stiffness for the structure. In the rear of the cabin the fuselage is braced against torsion by means of its ribs.

All component members, such as those making up the fuselage structure are protected against corrosion by varnish. The wood, used in the fitting only, is protected by varnish.

The wings are supported by chorded tubular steel bolted together with bolted web. Attached to the end of the tubes by rivets are angle fittings which in turn are bolted to the steel plate of the fuselage fitting.

The upper wing consists of three panels and the lower wing of two. The center section of the upper wing, if it may be called such, extends beyond the engine supports, as that is a structural feature. The engine case, the upper wing, the forward part of the fuselage form a single unit. The rear section is mounted at the fuselage by a "bracket" of four members from the rear wing spar and a "Y" of two members from the forward wing spar. These members are



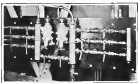
The engine at the rear of the fuselage of the Ray bomber. On the right is the main engine support.

supported from each side of the fuselage. The engine mounts are on interception struts in addition to the two vertical members near the tips of the lower wing. Additional diagonal members from the lower wing support the overhang of the upper wing. Two short struts connecting the support of these diagonal members and the upper wing spar complete the truss.

The wings are of the usual biplane construction being a

duralumin structure covered with fabric. The upper control is a Warren truss built up of two extruded T section members with duralumin cross bracing riveted in place. The T section members are fitted with a special design developed by Sikorsky, increasing the amount of fabric held by the vertical cable.

The wing ribs are of light duralumin channels built into a Warren truss. A single fitting holds two cross members in



Front view—control on the Ray.

place by three rivets. These fittings are interchangeable and easily produced facilitating construction.

Drag bracing is by compression struts built up under the main wing spar except that the fittings are lightened by hollow. The drag bracing is in two ribs bolted to the upper and lower flanges of the spar. Then fittings at this point are eliminated.

The T section members of the spar and those of the compression struts are joined by flat plates bolted to the engine spacers in the upper wing made by the same method.

The leading edge of the wing, forward of the front spar, is reinforced by steel duralumin. Like the fuselage the extruded duralumin members are riveted. These ribs come in contact with the upper flange, such as the ribs are painted with pyroxylin Valspar as the covering is offered by the dope.

The ailerons are of the standard type. They are mounted in false spar built up of two duralumin channels riveted to the main spar. Naturally a much lighter type would be used. The ailerons are mounted only on the upper wing. They are small and specially shaped making them very effective. They are differentially controlled by cables from the cockpit extending a yoke to the wing which in turn moves a rod connected to the aileron bars.

The structure of the empennage is similar to that of the wing. The horizontal tail surface is a non-divergent supported by two struts from the fuselage. The rear strut is placed or lowered by a screw mechanism thus changing the stabilizer setting. The screw mechanism is actuated by cables from the cockpit. All the tail surface members are integral except for the dagger strut which is by two external bracing.

The rudders, which have already been described, are not below the vertical line as they are automatically placed. The mechanism is at the tail end of the fuselage. It can be moved through an exceptionally large angle by a lever at the side of the cockpit. In case of an emergency the tail may be used as a rudder. In fact the rudder has been used with this rudder controls at all. The adjustment is very quick while flying with the engine at different speeds.

It has already been stated that the rudders are controlled by the rudder type pedals. These struts are supported from horizontal bracing across the fuselage which are connected to the control cables. The two cables are in the same horizontal plane and by taking the struts mounted on the forward tube and securing them on the rear tube and vice versa the rudder controls are crossed so a stationary in some fuselage condition. This is performed in a few moments whenever it is desired that the plane be in a condition to the crossed type of control.

The undercarriage consists of two separate units each weighing a 44 lb. by 18 in. wheel. Each support is a tripod with two members attached to the side of the fuselage and

shod to the wing thus distributing the load through the engine axle to the fuselage. The members are of flat, insular chrome molybdenum steel and the axles are fitted with roller bearings. The shock absorbers are by two coils of rubber discs and an oil cylinder. The rubber discs are in compression under a low test load having a five inch gap. The coils have a play of an inches giving a total gap of 31 in. on the release and a total of approximately 22 inches when the wheel is turned 15 ft. D. Hydrolytic springing is used in the landing gear as now being installed. The landing gear is operated by a lever between the two pilot's seats while the differential brake control is attached to the rudder pedals. This undercarriage was designed and built to withstand up to 25,000 lb. gross load.

The shock absorber on the tail did is very similar to that on the wheels except that it has a travel of only an inches. The tail did is mounted on this compression column and supported by two light members pin bolted at each side of the fuselage. It is fitted with a special oil cylinder on which is mounted a special adjustable shock absorber.

The engines are two General Motors Jupiter engines of approximately 500 hp. They are mounted between the wings as such only of the fuselage. Each engine is supported by two steel struts to the upper wing and by two duralumin struts to the lower wing in addition to a number of struts to the fuselage. The struts in the upper wing are of duralumin while the struts in the lower wing are of steel. These in the lower wing are built up of two T section extruded duralumin members riveted in a T section. These five members below the struts are in the center plane and are connected to the fuselage. An additional member, in the place of the lower wing, is added below the fuselage. All of these struts are fixed snugly and well and it is apparent that the struts are designed to reduce the interference between the members to a minimum.

The engines are started by a small two cylinder engine mounted on the fuselage below the cockpit. This starting engine which is standard equipment with the General Motors Jupiter engine.



The Ray bomber showing the engine, at the side of the cockpit, the main engine support, and the rudder.

Jupiter engine, have compressed air and gasoline late in the engine starting routine. The small engine is started by hand. All present the engine is used only as an engine starter, except the auxiliary engine, is a complete engine.

The engines are fitted with standard steel poppet valves 3/16 in. in diameter. In each engine valve is a perforated tube to be used as a fire extinguisher in case of an emergency. By means a control on the cockpit the extinguishing fluid is sprayed over one or both engines.

The main portion of the tail is formed in two bulky behind each engine and the continuous member, the both struts in half. In addition there are two gravity truss in the leading edge of the upper wing. By a simple system the tail may be jettisoned in other gravity load and thus in other engines. Behind the tail's engine, a counter balance is mounted on the wall of the cabin. On the control board are put rods that can be used to direct the flow of fuel from any of the needles back to the side of the gravity loads. The system is very







which the riser at one place is narrower and, in the right position, system employed. This system is built up from a long experience in the field. A trended force of specialists carefully check the parts being manufactured after every operation using modern measuring instruments of precision. All machined surfaces must have a high grade finish and surfaces are generally treated to metal scale. A final 100 per cent inspection is made of the finished parts before they are assembled. The inspection does not only cover dimensions, but the parts in their rough state are put through various strength tests. Test pieces made as part of the casting are flanged are cut off and subjected to tensile and impact tests, also, subjected to determine fatigue limits is indicated by very exacting specifications. A detailed means of detecting defects is employed which consists of ultrasonic of the parts in their rough and semi-finished state in strong acid solutions, which attack the surface of this part of the casting and defects such as inclusions and cracks immediately plain.

Rough materials in large are difficult to process due to the very complex and starting physical requirements. A systematic procedure is followed in the manufacturing depart-



Main lathe and tool post grinding machine, both of the White-Park type.

ments. The parts are made in accordance with specifications or instruction sheets which are carefully prepared to insure proper uniformity of manufacture. Special tools such as gauges, fixtures, etc., are used extensively to insure interchangeability and efficiency of manufacture. The personnel of the manufacturing department to whom no little credit is due for the success of the Whitehead engine is comprised of highly skilled and efficient operators who are impressed with the importance of their work.

The largest part of the engine is the crankcase main section which is an aluminum alloy casting prepared in one piece. Initially, expert care is required in receiving the sand and placing the cores and chills. Before leaving the foundry the castings are thoroughly cleaned and sand-blasted to remove and finish surfaces. The castings are put through a series of tests to determine their fitness, including a pressure test of the gas chambers. This is accomplished by drawing the openings applying air pressure to the extent of 75 lb per square inch, with the gas at the extreme pressure the castings are exposed to vary. The casting is subjected to water and acids are indicated by building. Defective castings are rejected. The castings used require a

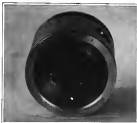
special heat treatment with the object of relieving and relieving strains. The castings are then ultrasonically in a hydrostatic solution for about 24 hours, after which a magnetic inspection is made for cracks, seams and other defects.

At this stage the castings are ready for machining operations, which are done in a nearly a progressive line up as possible. The boring and turning of both ends is done on a Balanced Vertical Boring Mill using standard tools. The next operation consists of fitting a bronze bearing ring tightly



Valve casting, aluminum hub and assembly

in place which is accomplished by applying heat locally around the bearing ring until the metal expands and usually allowing the bearing ring to be dropped in place. This ring is in addition to the crank pin is shaped like by means of a pin. The following operation is done on a Balanced Vertical Boring Machine and consists of boring the bearing ring and flanging the open end. The next operation is on a Horizontal Boring Machine, boring and fitting into cylinder flange holes equally spaced. The work is held on an index fixture and subdividing fixture and bronze tools are used. Following this operation wire inserts pipe bosses are bored, flanged and tapped. The drilling and tapping of all other small holes is accomplished on sensitive mills with the accuracy of the cylinder that hole in the size cylinder bore. There are eight holes in a yoke, and the drilling of these is accomplished on an upright drill press equipped with a multiple drill head.



Whispering valve showing connecting rod and head.

A few more minor operations are performed after which the parts receive final inspection and are then ready for final assembly.

Other parts handled in a similar manner are the crankcase front section, intermediate section and rear section crankcase. These parts are also aluminum alloy castings and in addition to the turning and boring operations requires a number

of milling operations. The rear section crankcase is particularly interesting because of the numerous oil passages which are machined automatically. This part is put through an extensive pressure test to determine its fitness.

A very interesting part is the cylinder head, and we give ourselves an effort to make this part a production. This part is a medium sized machine, they are cast, produced in our foundry. The castings are thoroughly checked and used blasted after which they are tested for defects, which is accomplished by drawing all openings and applying air pressure to the extent of 75 lb per square inch, and ultrasonically in water. Defects are indicated by building. The castings are then heat treated. The first machining operation is solely for the purpose of establishing positive flanging points for the necessary operations and consists of flanging the top



Oil and fuel pump assembly

inside of the open end and turning the first five to six diameters diameter and drilling and reaming up a 1/2 in. hole in the dome and of the cylinder to a given depth. The same object of this small bottom hole is to provide a stop on the boring lathe used on the next operation of machining the dome and will result in equal wall thickness at the dome and uniform compression chambers in the cylinders.

The next operation is, rough facing the open end and rough facing the dome. This is done on heavy upright drill using carbide tool. The finish is done on Jones & Lamson turret lathe using tools of special design. The boring and drilling of the cylinder bore is also done on this operation. The dome and face must be accurate and square within very close limits. The cylinders are then put through a series of pressure tests to determine its fitness before being used in the engine. The cylinders are tested as a special testing fixture and all openings securely plugged. Water is forced into the cylinder by means of a force pump is equipped to several tons initial pressure in the cylinder. If leakage or swelling occurs the cylinder is rejected.

The following operation consists of rough and finish facing and boring the exhaust port. This hole is held to close limits and is used as a locking point in all future operations, and special fixture and combination boring and facing tools are used on an upright drill press. Following operation are the facing and boring, also tapping the intake port hole on an upright drill press. The next operation consists of drilling and tapping two spark plug mount holes which are secured on the inner side of the cylinder using special tool and using carbide tools. Knocker hole pins are then fitted using a special index fixture on a Vertical Milling Machine. The following operation consists of boring the valve guide holes and using the valve seat inserts. An ultrasonic is formed for the latter. These are two separate operations using special index fixtures on an upright drill press.

The cylinders are then placed in a furnace heated to 650 deg. F. in order to expand the casting to permit the fitting of liners valve seat inserts. After the casting has been

removed the cylinders are placed on a holding fixture and the lower part of the valve seat insert is spun into the shape previously formed. The valve seats are then formed to a given fit within the valve guides. Following this operation drilling and tapping of all small holes is done on a standard drill press. Quick change collets and chucks are used throughout all operations involving the use of several tools on one spindle machine. The parts are then carefully inspected and following that the cylinder barrel is ground into the cylinder head. This is accomplished by heating the cylinder head in a gas furnace to 650 deg. F. in order to expand sufficiently to permit the grinding of the cylinder barrel in place.

The cylinder head is placed on an assembly stand and the cylinder barrel is quickly secured into place by hand. The intake pipe flange is also secured in place. This assembly being operation is really repeated but a fraction of a minute. The cylinder head and dome assembly as the part is now known is put through a final pressure test of 600 lb per square inch. The next machining operation consists of drilling eight holes in the cylinder barrel flange on a multiple spindle drill press and following this the flange is milled using a special tool in a gang not up. All other small holes are now drilled and the next operation consists of securing the spark plug inserts in place. These inserts are also machined in place. The valve guides are next ground into place. The complete assembly is now approved all over sampling finished surfaces with black enamel and baked in standard steps. The cylinder assembly is now ready for grinding which is done on internal grinding and followed by a bearing operation, which most result in an absolute polished bearing surface. All cylinders are carefully checked and the percentage of bearing is calculated. The cylinders are then run over using a special tool at all times are studs subjected to a normal stress. In order to determine this for various the motor test stands have a few vertical the entire length of the extended portion, which would not appear on double vertical line if the stand was in any way twisted. The cylinder assembly receives a final inspection and is ready for the motor assembly. All parts during length in the various manufacturing departments



Cylinder head and head showing the valve seats. The head is secured and closed.

are kept in separate compartments to prevent them being damaged by adjacent parts.

The cylinder barrel comprising part of the cylinder assembly is a flange of special steel. It is a rough machined all over in an assembled condition and put through a series of test treatments. A check on the hardness is made with the standard hardness testing machine. The barrels are then bored and fitted on double spindle barrel lathes. The outside diameters are also turned on a double spindle barrel lathe, using expansion action to hold the work. The next operation consists of turning operation, from an on inchworm drive lathe. The depth of the flange is more than a half inch and the top of the flange is 1/16 in. wide. Two lead blocks operate simultaneously and cut the flange from the valve barrel. The flange is now ground off, and fit is accomplished by a special tool (inspired to the top of one of the tool blocks. The

machine is stopped only to remove the work which is held in an expansive roller and to change tool blocks when the tools are worn. An entire set of tool blocks is assembled while one set is in operation to avoid any delay in the operation of the machine. The drums are cut on a third roller to fit gaps and are set .015 oversize for a slight fit in cylinders. After operation on the fixture of the end is a diam decrease from the flange and flange hub of flange. The part is carefully inspected before assembling to the cylinder head.

The roller heads of which there are now sixteen and nine make one permanent mold aluminum alloy castings. They



Current Best Model

are last stamped of very thin metal and require exceptional care in machining to prevent distortion and to maintain the geometry required. A number of drilling and milling operations are performed using gas and driving on all drilling operations. Mills, cutting and grinding milling methods are employed in the various milling operations. Disk grinders are used to machine the outer face. The parts are controlled on the outside and lapped to finish. The roller bars reverse and the drive beams are ground and formed from sheet aluminum complete on a punch press. The nose "Wright" is pressed into the upper part of the ring.

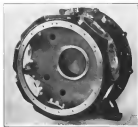
Once a machine of small aluminum castings such as oil pump parts, fuel pump parts, bearing retainers and others are permanent mold castings and are made to large quantities using the most modern foundry methods. These machines are last lapped to finish their structure and specimens of every model or lot are put through tensile impact and other tests to check their physical characteristics, which must meet within specified limits set by our engineering department. Recurring boundary tests are made to determine their molecular structure. No effort is spared to make cast castings, the finest castings that can be produced. The pattern used in the Waxford engine is well controlled. Waxford engine are composed of an aluminum alloy, known to us as "W" metal. The castings are made in permanent mold and have what would appear an excessive amount of metal to be removed by machining, but this has been found necessary to avoid severe stresses of surface distortion.

The castings are assumed by means of special heat treatment. The metal casting process is rather trying on the engine block and it was necessary to make an aluminum reserve into casting dies and after considerable experimentation we were able to get satisfactory results. As an illustration, previous to starting this project for one piston we were having the piston pin hole with a diameter measured in a boring bar which gave excellent results. However, as the new metal was cast on pin results and test holes were still bad. Various heat treat and metal dies were also tried without success. After considerable experimenting we found that aluminum plated tool gave superior results. Of late we have successfully treated the wrist pin hole. This method has greatly increased our production on this opera-

ture. An ordinary road bench is used which has detachable chromium plated bearing surfaces on the end.

The first operation on the piston is to remove the excessive metal and following this they are heat treated to refine the structure. The second machine operation consists of boring the skirt or open end to a diam decrease, for use on following machinery operation. The piston is held in a special chuck holding the inside dia. of the piston. The skirt opening is bored concentric with inside dia. within  $1/64"$ . The piston are drilled on the inside making the skirt entry difficult to hold. The following operations consist of drilling the wrist pin hole which is done on a drill press, turning the O.D. flange and centering the hole on the head, and rough cutting the ring grooves which is done on a semi-automatic machine. Following this the wrist pin hole is re-drilled and the outside diameter is finish turned, leaving stock for grinding. The ring grooves are finish turned and lapped by rolling, following this operation the wrist pin hole is rough bored on a special horizontal machine. The piston are now tested for leaks using hydrostatic pressure. The wrist pin hole is bored or finished to size, and following this the outside diameter is ground. The last operation consists of finish turning the head and removing the center or working face. The piston are now carefully inspected and weighed. The weight and tolerance is very close and the piston are drilled to the requirements by re-boring the skirt. X-raying is used to radiate throughout on all drilling operations. The product is kept in individual containers during transit between the machining operations.

Piston pins are made from special steel tubing bent and cut to length in automatic machine. Following this they are normalized, then relieved in semi-automatic grinding machine, and then hardened. Electronically controlled heat treatment and the parts are quenched in a vertical position to prevent warping. The parts are now ultrasonically at 54 per cent hydrochloric acid solution for about 30 min. The acid will attack defects much more rapidly than usual solution and the inspector can readily detect internal wrist pin. The pins



Wright Model. All three pistons arrive are ultrasonically tested. The nose center is the stage center part of the Wright Model.

are next ground on a vertical grinder making five passes, insuring low round on each pass. The following operation consists of grinding the open hole to remove the wrist pin plug as an internal grinder and providing the hole ends square on a vertical grinder. The last operation consists of lapping the outside dia. to size limits of which is .0005 on a production type lapping machine. The parts are carefully inspected for size and ultrasonically tested in wet paper.

The valve tappet guides are ground and lapped. They are carefully checked to remove oval and improved before

beginning assembly operations. The parts are checked in barrel before the final is rough turned and drilled and reamed through, followed by an operation of turning the outside diameter and facing the flange. The part being held on a shoulder when and using sandblast and blast in order to form all the dimensions at one time. The parts are now reamed and following this a hole is punched through the hole to internally the metal at the hole leaving approx .005 for grinding the hole. The parts are held in a chuck and when reaming outside of outside surface which are to be left out. The two holes in the flange are drilled on a multiple drill press. The guide slot for the valve is milled into, multiple fixtures using a gang mill and the slot is cut on a horizontal milling machine. The parts are now hardened and heat-treated to remove the scale.

#### Parts Inspected in a Chemical Solution

The parts are now mounted in a chemical solution and removed for fracture and other defects. Final operations are the grinding of the hole which is done on a Revere semi-automatic internal grinder and the outside diameter on a plan grinder while the work is held on a lathe. The parts are thoroughly inspected and checked for dimension and followed by an assembly operation making a tappet and guide assembly. The tappet is from bar stock turned, drilled and cut into the shape of an automatic tappet. The operation of shifting is accomplished on a horizontal milling machine on reamer on several parts at one time. The hole for the roller pin is drilled and held in relation to the slot. The parts are then hardened and put through the final right hand grinding on the tappet guide. The ball holder is next pressed into place and the outside diameter ground to size on a reamer grinder.

The ball holder and guide and ball are made of special steel and completely formed on automatic machine. The parts are hardened by a cyanide process. The ball holder is made on a Rockwell machine using a ground steel. The shape of Rockwell is 1.54 in. 60 max. The parts are measured in a cyanide acid solution and removed for defects. Previous to hardening these parts, ball ends are ground using a special ball grinding device on a plan grinder.

The valve washers are made from bar stock on automatic machine. A second drilling operation is required to form the larger hole. The parts are ultrasonically inspected and a cyanide process which does not scale the parts. The position of same and must not imperfection is checked on the parts as they are drilled upon a very important part of the engine. Valve adjustment using diamond grinding and the inspection of this part. Of equal importance are the valve lock washers. They are also made of special steel on automatic machine requiring a second drilling operation. Very cooling device and made of this part. An operation of splitting in halves is performed on a lathe making the parts are then finished by the cyanide process.

#### Electronic Electrical Testing Equipment

Valve openings are made by spring pressure in one operation. Careful inspection is made using electronic detection testing equipment. The valve guide guide is made of an special heat treated steel bar stock and is cut on a semi-automatic machine. The outside is ground to size. The valve guide guide is made from a ground steel bar stock rough cut on automatic, then normalized and air-hardened. Following this is lapped in order to insure the grinding allowance in the hole is approximately .005. The parts are hardened and tested. A semi-automatic internal grinder is used to grind the valve shaft in  $1/32"$  dia. and about .0015 in. long. The valve diameter is next ground, the parts being held on an arbor.

The valve are made by a repeatable process in one operation at the machine factory and they are put through reaming and grinding in one operation. The valve are carefully inspected at this factory for defects, tapping, chemical and metalurgical mass. The amount valve require additional sandblasting as follows: They are dipped in gasoline and then in a balling oxide acid solution to remove all the scale.



Removal from the Machine

are next annealed head down in a bath containing approximately pure potassium nitrate at a temperature 700-800 deg. F. and all bubbling from outer areas. They are next reamed about the top and a  $1/2$  in. diameter and which has been produced in the temperature of the bath is pushed down and all stress in the top of the valve is taken from the both and placed in a bath.

Valve stem pins are next driven into the valve stem using an arbor press. For the purpose. The valve are then washed and placed in a furnace and heated to 700 deg-750 deg. F. for half hour. After cooling they are inspected for scale and dipped into a 50 per cent hydrochloric acid solution at 150 deg. F. and finally washed, inspected and placed in finished shape. The lapping of the valve seat is done at a machine. The workpiece is a cylinder of special steel and a flat plate in a lapped part of every shaft. This test plate is cut off and corresponding machine are stamped on the shaft and last time. The test plate is put through a series of tests in order to check the physical requirements and a complete record is kept of every performance. The shafts are roughed machined all over, then placed in a 50 per cent hydrochloric acid solution for about one half hour, then lapped in accordance with the procedure they are carefully inspected for defects. The shafts are finally finish machined and ground all over.

There are about 35 operations necessary to complete a shaft. Operations consist of turning, milling, gas heating and grinding. In nearly every operation two shafts are machined upon at one time. Considerable care is exercised in making these shafts in order to maintain symmetry which is very essential in order to maintain a perfect balance of the shaft assembly. The balance and weight are held on a hole and center balance requirements are obtained which are checked on a high speed balancing machine. The balance weight is composed of a bronze and steel assembly in the shape of a segment and attached to shaft by means of special bolts and wires.

Poppet balls and flanges are of steel design in size the customer requirements but they are immediately after lapping rough machined, heat treated and finish machined all over.

The poppet ball balls are finished complete on automatic machine.

These valves are a special steel forging of unusual shape. The parts are put through very severe tests to determine their fitness. They are designed to remove the die flash and rough polished all over.

Following this they are placed in a strong acid solution and



# BRYANT



grinds important parts of  
Wright  
"Whirlwind"  
Motors

••

Cylinders  
Connecting Rods  
Valve Guides  
Cam Rollers



Connecting Rod  
Holes ground  
on No. 15 Bryant

Cylinder  
Ground internally  
on No. 20 Bryant

The No. 20 BRYANT GRINDER shown is one of five BRYANTS in the Wright Aircraft Corporation Plant, Patterson, N. Y.

Work of this type is a tribute to the accuracy and efficiency of BRYANT GRINDERS made possible by the wheel slide control.

BRYANT CHUCKING GRINDER CO.  
SPRINGFIELD, VT., U. S. A.



*We are proud of our contribution*

*A CONFIDENCE in the U.S. HAMMERED PISTON RINGS is the surest evidence of a pilot's confidence in the quality of his engine.*

*In such engines, U.S. Hammered Piston Rings, which are made of the finest material, and are ground to the proper shape, are the only rings that will give the best results in the long run.*

*And it is this confidence that gives the pilot the peace of mind that is the most important factor in the success of his flight.*

**U. S. HAMMERED  
PISTON RINGS**

give a performance consistent with that of the wonderful Whirlwind because they are scientifically designed and manufactured to give the utmost in performance.

*Reasons why you should specify*

*U. S. Side Hammered  
Piston Rings*

1. The only true side hammered ring.
2. Has a flat surface.
3. Uniform wall thickness.
4. Expands uniformly against the cylinder wall.
5. Maintains its pressure under any heat of the motor.
6. Compression tight from the start.
7. Perfect oil control.
8. Long life.

For further data,  
Distributors write for proposition.



**U.S. HAMMERED  
PISTON**

**RING CO.**

IRVINGTON, N. J.



# AIRTITE

## IGNITION CABLE

Standard Equipment On

# Wright Motors



*Meets Army,  
Navy and S.A.E.  
Specifications*

"Install it  
and forget it"

Insulated with live rubber and protected with a flexible, enameled coating that is

UNAFFECTED BY ENGINE OIL, GASOLINE, OZONE, SALT  
WATER, OR FRESH WATER, AND WILL STAND THE  
SEVEREST CORONA TEST

—♦—  
*Write for samples and test figures*  
—♦—

The Acme Wire Co., Dept. N, New Haven, Conn.

AN **ACME** WIRE  
PRODUCT



When  
**SAFETY**  
*depends on*  
**STEEL**

**I**t was with justification that we read a recent letter from Wright Aeronautical Corporation advising us that in the marvelous Wright Whittell Engine used in the successful flight of Col. Lindbergh, Major Chanhelle, Commander Byrd, Lieutenant Mailand and Hagenberger, and Merritt Smith and Boats, "Most of the alloy steel bar stock was furnished by the Carpenter Steel Company of Reading, Pa."

To know that Carpenter quality has contributed in some measure toward the advancement of safety in flying is

a matter of real satisfaction to us. Then again is the quality of Carpenter Steels given new honor—a quality justifying its use in any product where performance must depend upon steel. These steels are truly fulfilling their entire promise of value in thousands of manufacturing plants and to these manufacturing

plants the name "Carpenter" is an accepted guarantee of highest quality. If you have problems in plant or product, which seem to demand an altogether Super-Steel, you are invited to send yourself of Carpenter Service.

THE CARPENTER STEEL COMPANY, READING, PA.

*Carpenter*  
**ALLOY STEEL**



## STANDARD STEEL *Adjustable Pitch Propellers*



**S**TANDARD STEEL PROPELLERS insure resistance to climatic changes and are designed to give maximum performance under the most varied flying conditions.

Used on the Loening Amphibian planes of the Pan American flight, the Ryan NYP plane of the trans-Atlantic flight.

**STANDARD STEEL PROPELLER COMPANY**

*General Offices & Works*

221 SEVENTH AVENUE

WEST HOMESTEAD, PA.



**T**HE imperative necessity for the utmost in dependability dictated the use of "Hoffmann" Precision Roller Bearings to carry the crankshaft in the Wright "Whirlwind" Engines used by the transoceanic fliers whose names make up the honor roll above.



And, where dependability is put to a severe test, the loads must be steady and steady, (as with the Pioneer Earth Indicator Compass) engineers specify



In both open and closed types, in the range of sizes leading up to the roller to the heavier duty for which "Norma" are so well adapted.

Carries an expert

**NORMA-  
HOFFMANN  
BEARINGS  
CORPORATION  
STAMFORD, CONN.**



# Yes, we are proud



Wright  
Whirlwind

**PROUD** of the fact that Wright Engines and Thompson Valves have worked together for a decade.

Proud of our intimate association with Wright Engineers in the period of greatest advancement of aviation.

Proud of our part in the triumphs of great Wright Engines of the past.

Proud of the many flying feats made possible by the Wright Whirlwind of 1927—and the Thompson Valves that flew with it.

For in every automotive vehicle  
"THE VALVE IS THE HEART OF THE MOTOR"

THOMPSON PRODUCTS, INC.  
General Offices: Cleveland, Ohio, U. S. A.  
Factories: CLEVELAND and DETROIT

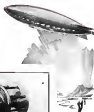


Thompson Valve used in Wright Whirlwind Engines.

## Thompson Valves



**SKF**  
IN  
AVIATION



## SKF—The Dependable Bearings For Pratt & Whitney Crankshafts

**WHIRLING** at high speeds, the SKF Bearings on the crankshaft of this high-powered Pratt & Whitney engine have proven advantages which may be summed up in one word—dependability.

The success of SKF Bearings in avia-

tion is not based on chance selection. Quality materials plus the utmost precision in manufacture insure smooth and easy running bearings without sacrifice of ruggedness. These are the bearings which have been first choice on all history-making flights of the past decade.

SKF INDUSTRIES, INC., 40 East 34th Street, New York, N. Y.

208



Ball  
Bearings

Roller  
Bearings

## THE LEECE-NEVILLE COMPANY



Whirlwind Engine with Leece-Neville Type CC-1 Governor

Wright engines are provided with mountings for Leece-Neville voltage regulated generators.

Leece-Neville armatured generators are voltage regulated, and hence no regulated the use and weight of the storage battery is reduced to a minimum. Voltage regulation permits the generator to charge a storage battery at the correct rate for the state of charge that the battery is in at that time. The battery can not be burned out from over charging. Voltage regulated generation

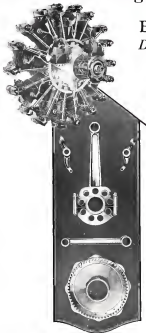
may also be used when disconnected from the storage battery.

Leece-Neville generators are used by the United States Air Service, the United States Navy, Aeromarine Branch of the Department of Commerce, and many private operators including the National Air Transport and Eastern. Leece-Neville generators are used where rigid flying is necessary or desirable.

Our Engineers will make recommendations for installation under difficult circumstances.

THE LEECE-NEVILLE COMPANY - Cleveland, Ohio

## The Famous Wright "Whirlwind" with BETHLEHEM DROP FORGINGS



It has been our pleasure to have had a part in supplying materials for the construction of the Wright "Whirlwind" Engine which has been outstanding in recent aeronautical accomplishments.

After steel drop forgings have been supplied by Bethlehem for the manufacture of such important parts of "Whirlwind" Engines as Master Connecting Rods, Armatured Connecting Rods, Inlet and Exhaust Cam and Inlet and Exhaust Valve Rocker Arms. The fact that these parts have continuously met the demands of the service service to which they are subjected is fine evidence of the dependable qualities of Bethlehem alloy steel products.

Control of every step in the manufacture of Bethlehem drop forgings, from the ore to the finished product, is assurance of the selection of materials best suited for the service intended, and their correct treatment. This is an especially important consideration in the case of aeronautical equipment, where dependability of every part is vitally necessary.

### GOLD MEDALS

awarded Bethlehem at the recent Ingersoll-Congress Exposition, Philadelphia, as recognition of the high quality of both Bethlehem alloy steels and Drop Forgings are further evidence of the effect of these products.



BETHLEHEM STEEL COMPANY  
General Office: BETHLEHEM, PA.

### DISTRICT OFFICES

New York, Boston, Philadelphia, Baltimore, Washington, Atlanta, Pittsburgh, Buffalo, Cleveland, Chicago, Cincinnati, Chicago, St. Louis, San Francisco, Los Angeles, Seattle, Portland, Berkeley, and Export Overseeing, at Brooklyn, New York City and London, England.

# BETHLEHEM



The Modification of  
Bearing's Design

## SRB BALL BEARINGS ARE AN IMPORTANT PART OF WRIGHT WHIRLWIND ENGINE *Success!*

WRIGHT "WHIRLWIND" ENGINES have been called upon for the most astounding flights in aeronautical history and have invariably fulfilled every expectation for their reliability—consistency—durability and safety where proper preparations were made.

That SRB Annular Ball Bearings with balls forged from Molybdenum Steel are used as main bearings on the mighty crank shaft line, and the propeller end of the crank shafts, is significant.

SRB Bearings are eliminating friction and absorbing thrusts and strains in every industrial field in America.

STANDARD STEEL AND BEARINGS INCORPORATED

Plainville

1000 RAIL BEARINGS  
—High End

Connecticut

## Insurance against engine repair

The first thing to do before making any extensive repairs or adjustments is to have the ignition checked and the spark plugs looked over.

Many times expensive repair bills are incurred and it is afterwards found that all that was needed was a new set of spark plugs. This

because spark plugs in time deteriorate and need to be renewed. Lindbergh, Chamberlin, Byrd and other great flyers staked their lives on AC Spark Plugs in their epoch-making flights.

You, too, can have the same spark plugs. See your dealer for the right type and size for your engine . . .

*Lindbergh* **AC** *Maitland*  
*Chamberlin* *Hegenberger*  
*Byrd* *Acosta*  
**The Winners**

AC Spark Plug Company, FLINT, Michigan

Over 200 of the world's most successful manufacturers use one or more, or all of these AC Products  
**AC SPARK PLUGS AC SPEEDOMETERS AC AIR CLEANERS AC OIL FILTERS**  
**AC FUEL PUMPS AC GASOLINE STRAINERS AC AMMETERS AC OIL GAUGES AC THERMO GAUGES**

## For completely dependable *sure-fire* ignition

Splitdorf Magneto for aircraft are built with a thorough knowledge of the vital requirements of the service and with seasoned experience in the manufacture of magnetos for both government and commercial ships.

The extreme importance of utmost dependability under severe conditions has been the foremost consideration in their design and construction. They are built for absolute reliability—for sure-fire ignition under any circumstances.

The Splitdorf Model VA Double Magneto, illustrated opposite, has independent electrical circuits, produces four double sparks per revolution, either synchronized or staggered, and is suitable for the heaviest types of engines with from four to twelve cylinders. This instrument is provided with 30 degrees advance.

Full information on this model and other Splitdorf magnetos for air service sent on request. Splitdorf Electrical Company, 352 High Street, Newark, N. J. Subsidiary of Splitdorf-Bethlehem Electrical Company.



Splitdorf Model VA  
Double Magneto

Pat. U. S.  
7th. 26.

**SPLITDORF**

Established  
1910

# ECLIPSE

## AVIATION ENGINE STARTERS



[ Eclipse Starter & Model (Single) Starter Installed on Wright Whirlwind Standard JHC Engine ]

Eclipse Aviation Engine Starters have the approval of the Wright Aeronautical Corporation, and are extensively used on Whirlwind Engines.

## ECLIPSE MACHINE COMPANY

EAST ORANGE PLANT

Glens, New York

EAST ORANGE, NEW JERSEY

Walkerville, Ontario



7



8



1



9



10



3



11



12



15



16



2



13



14



17



18



19



20



21



6



22

1. Col. Charles A. Lindbergh's New York to Paris, RYAN MONOPLANE "Spirit of St. Louis". 2. Chamberlin and Levine's trans-Atlantic BELLanca MONOPLANE "Columbia". 3. Comandante Dreyf's trans-Atlantic FOKKER MONOPLANE "America". 4. Smith and Brodie's California to Hawaii TRAVEL AIR MONOPLANE. 5. Schlier and Brodie's "around-the-world" STINSON-DETROITER MONOPLANE, "Pride of Detroit". 6. Brown and Schabert's BRESEE MONOPLANE "Aloha", winner of second place in Dole Derby. 7. FAIRCHILD F-2 cabin monoplane. 8. FORDSTOUT, all-metal three engine monoplane. 9. WACO TEN built by Advance Aircraft Co. 10. HAMILTON all-metal monoplane. 11. SWALLOW biplane. 12. Vought VO-1. 13. CURTISS HAWK training plane A.T.5. 14. Sikorsky S-36 two engine monoplane in amphibious. 15. Yackey monoplane. 16. Canadian VICKERS VARUNA. 17. LOCKHEED "VEGA". 18. KEYSTONE PELICAN. 19. CONSOLIDATED COURIER training plane. 20. PITCAIRN MAILWING. 21. BHL AIRSEDAN. 22. ALEXANDER EAGLE ROCK.





**All Wright  
Aircraft Engines  
now in production  
are equipped with**

**SCINTILLA**

*Aircraft Magneto*

Model AG20  
Used on Wright  
Whirlwinds



**SCINTILLA MAGNETO COMPANY, Inc.**  
**SIDNEY, N. Y.**

*Contractors to the U. S. Army and Navy*



*The Whirlwind*



*The Cyclone*



**The Record of American achievement in the air is the record also of the Wright Whirlwind Motor with Bohn Ring True Bearings**

The Wright Whirlwind Motor has identified itself in the minds of the public with the utmost progress in the aviation world and has established for itself a record of unequalled reliability.

Riding along on the crest of this well earned and deserved reputation, Bohn Ring True Bearings, as an important and integral part of the Wright Whirlwind Motor, are being credited with a share in the honors thus won.

Here is the univalued trans-oceanic record of the Wright Whirlwind Motor to date.

Commander Byrd's epochal flight over the North Pole.

World's record sustained flight of 51 hours by Chamberlin and Axtell.

Lindbergh Flight—New York to Paris.

Chamberlin-Levine Flight to Kaituma, Germany.

Commander Byrd's Flight to Ver-sur-Mer, France.

Murford-Hogenberger Pacific Flight to Honolulu.

Arthur C. Goebel's winning flight in the Wendover—Oakland to Hawaii.

Martin Jensen in the Aloha—second in the Dele flight—Oakland to Hawaii.

*In each one of these flights the Wright Whirlwind Motor used was equipped with Bohn Ring True Master Rod Bearings and Crankshaft Rear Bearings.*

**BOHN ALUMINUM & BRASS CORPORATION**  
DETROIT, MICHIGAN

*Also makers of Delco-Light Coatings and Nelson Schenck's Plates*

**BOHNALITE**

## EXTENSIVELY USED

IN THE ASSEMBLY OF



WRIGHT WHIRLWIND ENGINES

## "WHITNEY" MACHINE KEYS

FOR THE  
WOODRUFF SYSTEM OF KEYINGTHE WHITNEY MFG. CO.  
HARTFORD CONN.SUMET  
PRODUCTS

A high lead bearing bronze made by the Sumet Patented Process. The process ensures a homogeneous structure, prolongs bearing life and prevents scoring or fretting the shaft.

Why not insist on Quality Bronze for absolute dependability?

Lambert, Chamberlin, Ford, Mustang, Goebel and Jenson, in aviation, Flying Heavy, and SUMET for Valve Rocker Bearings and Crank Shaft Counter Weights in the Wright Whirlwind Engines.

SUMET BRONZE BEARING METAL has the unusual properties of combining the strength of bronze with the non-frictional qualities of babbit, and has one of the inherent workmanships of rubber. These features manifest themselves in a longer wearing — Better Bearing.

We respectfully solicit your inquiries for your most difficult bearing problems.

SUMET CORPORATION  
1543-1639 Fillmore Ave., Buffalo, N. Y.ENDICOTT  
FORGINGS

are used in

The Famous Wright  
Whirlwind Engines

DROP FORGINGS



## Recommendation

"THERE are many excellent periodicals on aviation. We particularly recommend AVIATION a weekly, published at 250 West 57th Street, New York City."

This quotation is from the Supplementary Information Bulletin of the Wright Aeronautical Corporation of Paterson, New Jersey.

Read AVIATION each week. A one year subscription in the United States is four dollars, in Canada, five dollars, and in other countries, six dollars. Aviation Publishing Corporation, 359 West 57th Street, New York City.



The Oldest Aeronautical Magazine

ACCURATE PRODUCTION  
EQUIPMENT ESSENTIAL

for quality workmanship required in aviation engine construction.

In the Wright Aeronautical Corporation plant several of our production SELF OILING ALL GEARED Drills do their part in maintaining careful standards of accuracy. The remarkable accomplishments of world-famous firms in planes powered with Wright Whirlwind Engines prove their wonderful sturdiness and efficiency.

Let our experienced engineers help solve your problems in accurate boring, drilling, reaming, facing, and honing operations.

Catalog "W" will be mailed upon request.



## BARNES DRILL CO.

811 CHESTNUT ST.

ROCKFORD, ILL.

CRANKSHAFTS  
FOR  
WHIRLWIND ENGINES

The Whirlwind that Art Goebel flew from San Francisco to Hawaii was powered by a Wright Whirlwind that had a Union Switch and Signal crankshaft. We are proud that our products are being used by the makers of Whirlwind for an engine that has proven so consistently good. The continued selection of Whirlwind engines is justified by their flawless operation and uniform performance.

Modern production facilities for any type of drop forging up to 500 pounds in weight. Complete heat treatment and laboratory facilities backed by 44 years experience. Our engineers are always at your command. Estimates and quotations made without obligation.

## UNION SWITCH &amp; SIGNAL CO.

3840 PARK DIVISION

PITTSBURGH DISTRICT

SPRINGFIELD, PA.

## Oil and Gasoline Strainers

The Famous Wright Engines are equipped with our Strainer Assemblies

Specialists in wire mesh forms, stampings and assemblies and metal specialties for fifteen years.

Send us your blue prints and specifications. Our Engineers are at your service.

INDUSTRIAL ELECTRIC MFG. CO.  
WAYNE, MICH.



## Durability Quality Service

There Safety never wavers  
for every engine test

Conquerors of the Atlantic and Pacific skies depended upon Miller and Van Winkle's Valve Springs. Convincing demonstrations of quality durability and service of Eagle Brand Springs assembled in all Wright engines.



Miller & Van Winkle, Inc.

18 Beidge Street

Brooklyn, N. Y.

Manufacturers of Hot and Cold Rolled Springs of every description.

When ignition



**MUST**  
be positive—

you can bet  
your life on

**Rajah**

Lock Clip Terminals

Col. Lindbergh did!

The famous Wright Whirlwind Motor was equipped with these rare contact wires on his record breaking flight. Made by America's oldest manufacturers of superior terminals, spark plugs and other ignition specialties.

The Rajah Company  
Bloomfield, New Jersey



Whirlwind J-5



Whirlwind Crankshaft

## CRANKSHAFTS

FOR

WRIGHT AERONAUTICAL CORPORATION  
ENGINES

Ohio Crankshaft Company  
makes crankshafts for  
Wright Aeronautical Corporation engines

Makers of Crankshafts exclusively  
Valve production  
Model and experimental Crankshafts

OHIO CRANKSHAFT COMPANY  
CLEVELAND, OHIO

In the past two years one of the outstanding developments in American aeronautics has been the increased production of aircraft using a single power plant of approximately 200 horsepower or a power plant composed of multiple units of approximately 200 horsepower each. Almost without exception these power plants have been the product of one company and of the same type, the Wright Whirlwind J-5. The fact that so many aircraft manufacturers design their planes around the Whirlwind en-

gine is a wonderful tribute to the Wright Aeronautical Corporation and the companies cooperating with them in producing this engine.

On the following pages of this section will be found the advertisements of leading American manufacturers of aircraft who use the Whirlwind engine. The splendid performance of these planes is a tribute to the designers and constructors of them and to their judgment in the selection of a power plant that brings out the best in their design.

Aviation Publishing Corporation, 250 West 57th Street, New York City.





NOTABLE tribute to the unusual esteem in which the Boeing Airplane is held is the fact that an important share of the United States Government airplane requirements, both naval and military, are entrusted to the Boeing Airplane Company.

**Boeing Airplane Co.**  
Seattle, Washington

*Mail by Air and Speed is There*



### *WACO Ten Leadership Maintained in "Whirlwind" Airplanes*

The Waco organization known everywhere as a large family of peopled, conscientious craftsmen; satisfied with no less than the utmost in efficiency and perfection of workmanship have developed production methods and features of design unequalled in the industry.

This organization sensing the potential market for Wright "Whirlwind" Waco Airplanes have perfected their plane to such a degree of strength and efficiency that the Wright Whirlwind motor can be mounted in their regular Model Ten at a price far below equipment of similar specifications.

Performance, speed and maneuverability were always in mind and have not been

sacrificed for price in offering the Waco Ten "Whirlwind" to the trade. This is clearly evident when you consider the wonderful record of these ships in the Third National Air Tour.

- finished with highest percentage of possible points, 99 and 98 percent of possible 100 percent obtainable.
- won highest average speed for entire 4166 miles of tour, averaging 118.23 M.P.H.
- four ships were entered and four ships finished.

*Ask us for complete details of the  
Waco Ten "Whirlwind"—  
regular with the name of our nearest distributor.*



MANUFACTURED BY ADVANCE AIRCRAFT CO., TROY, OHIO



## Department of Commerce . . .

WITH THE Fairchild "All Purpose" biplane, the Department of Commerce has on its list of the United States. The biplane which powered the Department of Commerce to the Fairchild field in the year the company's success in the United States was.

Never before has practically 100 percent success been obtained, with the engine, down on each side, 45 degrees forward through the fuselage and rear back through the tail to see an excellent engine—although it takes a great "step" to overcome it.

Airplane system of engine design is made of a standard engine, which quickly folds in the side for plane, glider or freight carrying use, and with three large doors for convenient entry. Try it "All Purpose" ship!

Performance which can only be obtained by the most extreme refinements in construction, the result of six months' work in the wind tunnel. Controls which are sensitive, quick, and operate with slight pressure—through use of such, properly designed control system without undue risk to the pilot. It's the best you can get!



Folds easily folded in the compact form in two minutes!

such an engine that Curtis and the Department of Commerce pilots do not hesitate to leave the pilot's seat for long periods.

Such improvements in wings that can be folded in less than five minutes, a new type of landing gear without rubber and without seriously protruding under fuselage is described. The Fairchild Monoplane is the latest in the series of such improved airplanes in Department of Commerce, Curtis Flying Service, Edward E. Ryan, Manager, Bufile Airport, Washington, D. C. and Wright Whirlwind Motor Standard Equipment.

Fairchild is ready for the demand with a new factory and complete production equipment. For the first time in the history of the world a quality airplane—of a type made possible only by two a week production. But this airplane is the first in the line, as of the first Fairchild type, so it is now the first in the line of quality production in the new plane. Fairchild Aircraft Manufacturing Corporation, Farmingdale, L. I., N. Y.

# FAIRCHILD



FAIRCHILD AIRCRAFT MANUFACTURING CORPORATION  
FARMINGDALE, LONG ISLAND, N. Y.

Please send me your complete catalog.

( ) I do not wish to register.

( ) I am interested in airplane with a \_\_\_\_\_ engine.

Name \_\_\_\_\_

Address \_\_\_\_\_

## The Ryan Brougham

### Five Place Monoplane



Wright Whirlwind Motor Standard Equipment

Loading a new trend in aeronautical design we have built the Brougham to carry 83 gallons of gasoline, pilot, four passengers, and baggage of five suit cases conveniently stowed out of the way in the rear.

Fully loaded the usual performance of this type monoplane is at once apparent, quick take-off, slow landing speed, high cruising speed, and excellent maneuverability.

Upholstered in silk mohair with the entire cabin insulated with Balsam wool, owners are finding this newest product of the Mahoney Factory not only efficient and economical but unusually comfortable.

"The same model that Colonel Lindbergh flew, adapted to passenger carrying."

\$9,700.00 at San Diego.

## B. F. MAHONEY AIRCRAFT CORP.

SAN DIEGO, CALIFORNIA

*A Perfect Combination—*

## The Pitcairn Mailwing



and the

### Wright Whirlwind Engine



THE PITCAIRN MAILWING

A MAIL AND EXPRESS CARRYING AIRPLANE OF CHARACTERISTIC PITCAIRN CONSTRUCTION COMBINING TO AN EXCEPTIONAL DEGREE THE ESSENTIAL QUALITIES OF:

**HIGH PERFORMANCE**  
 (Top speed 135 m.p.h. Min. speed 45 m.p.h.)  
**MANEUVERABILITY**  
**EASE OF MAINTENANCE**  
**LOW COST OF OPERATION**

Price \$10,000 at the Factory

Including full complement of instruments and complete night flying equipment

Full details upon request

**PITCAIRN AIRCRAFT, INC.**  
 LAND TITLE BUILDING PHILADELPHIA

### SIKORSKY TWIN-MOTORED AMPHIBIAN



Powered with two (2) Wright Whirlwind 224 H.P. J-3 air-cooled engines.

Comfortable cabin for eight passengers including the pilot.

For those who have felt the handicap of insufficient landing fields the Sikorsky Twin-Motored Amphibian affords the possibility of using the waterways for landings and take-offs in addition to the existing aerodromes.

Equipped with Sikorsky patented compensating rudders these ships have the ability to fly on one

motor with full load which greatly increases safety of operation.

These ships can be supplied without landing gear and used as flying boats.

**SIKORSKY MANUFACTURING CORP.**  
 COLLEGE POINT LONG ISLAND

*Notice:* Beginning October 1st, 1937 the offices of the Sikorsky Manufacturing Corporation will be moved from New York City to the plant of this corporation at College Point, Long Island.



## "Not Enough"!

What we thought would be enough for a year did not last eight months.

The first 1932 Travel Air equipped for 25 Whirlwinds — the largest single order placed for these engines up to that time.

Although the contract was based on a year's experience, the demand for Whirlwind-equipped Travel Airs has already exceeded the original contract. Get behind a Whirlwind engine in a

**TRAVEL AIR**  
 BI-PLANE or MONOPLANE

open the doors — take her up — and you'll know what REAL FLYING IS!

Write us for literature and prices

## Travel Air Mfg. Co., Inc.

General Offices and Factory,  
 Wichita, Kansas



# FOKKER AND WRIGHT

Airplanes

Engines

When an important or difficult project is undertaken, why is the above combination insisted upon by both pilots and organizers?

## BECAUSE

they both manufacture quality products, tried and proven by many years of experience.

ATLANTIC AIRCRAFT CORPORATION

Factory and Flying Field:

Teterboro Airport  
HASBROUCK HEIGHTS, N. J.

**Fokker**  
USA

Sales Office:

110 East 42nd St.  
NEW YORK CITY

# ALEXANDER EAGLEROCK

Special built WRIGHT WHIRLWIND MOTORED



In the Standard Air-Trip  
of your trip this ship  
should be up to you—the  
leader of all airplanes.

Ask your dealer  
or may be purchased in This Country



ASSOCIATED WITH ALEXANDER INDUSTRIES, INC.  
New York, Alexander Industries Bldg. New York City

## Wright Whirlwind Engine Production

(Cont. from page 752)

retained when the running test begins. Windmills are provided in the sides of the tunnel for observation. Experts are in charge of all tests, and careful records are kept of every engine. The test mentioned last is known as the procedure "running in test" and consists of five-hour continuous with the test two hours at one-half load.

The engine is disassembled and all parts carefully inspected and then reassembled.

The engine is again placed on the dynamometer test stand and operated at "running in speed" for one-half hour, then run at one-fourth load for one-half hour and then operated at one-half hour at the rated load and finally at 1.25 times rating test. A record is kept of the fuel consumption, oil consumption, oil pressure and temperature, both fuel and water of the engine. The engine must develop the guaranteed 200 h.p. rated at 1900 r.p.m.

The engine is given over carefully, and is built in a rigid, and a special inspection is made of all wings, tubes, etc. The engine is tested for clearance in a specially constructed box. A tool kit of 500 service tools is included with every engine. A complete record is kept of the history of every engine and our latest does not come from. A Service Department, the personnel which consists of engine repair and engineers, at all times of the service of the customer and public is present.

## Navy Flies Pilot PN-10 to 6,975 Ft.

Another surprise record was added to an already notable list when on Aug. 10 Lieutenant (jg) J. Connel and Pilot C. B. Hall, attached to the aerial operations of the battleship East at San Diego, Calif., climbed a heavily loaded PN-10 Navy airplane to an altitude of 6,975 ft.

Lieutenant Connel and Hall are believed to have surpassed the former record of A. H. Roscoe, British aviator, who in 1925 flew a Sopwith Camel airplane loaded with 500 lb. of sandbags, to an altitude of 3000 meters or 9842 ft. These altitudes to the PN-10 registered 6975 ft. at the highest point, Lieutenant Connel announced. A state-of-the-art flight lesson for the Navy aviators was filed following

the flight with the National Aeronautics Association by Lieutenant Roscoe, San Diego member of the recent committee of the national body.

The PN-10 weighing about 10 tons, took off from the runway of the bay at 3:43:00 P.M. and landed 1 hr. 14 min. 33 sec. later. The big plane climbed the water for almost two miles before it took the air, then making large circles over North Island. A steady but steadily gained altitude, until 6975 ft. was reached. Lieutenant Connel said that this height was the absolute air limit of the PN-10, loaded as it was with 5000 lb. of sand bags. Although the big plane carried her load as heavy as the high point, not another foot of altitude could be gained.

During the first half the flies spent so much time in an effort to stay near the water, the PN-10 was out of position by the time it reached again on the bay. A strong gust was called to tow the plane to the landing beach of the Naval Air station.

## Air Mail and Travel Increase for P.A.T.

Air mail weights between Pacific Coast areas during August increased nearly 50 per cent, according to the airline's traffic report made public recently by A. K. Hargrave, vice president of Pacific Air Transport, combined air mail, passenger and express line.

These figures are the highest recorded by P.A.T. in nearly a year of operation up and down the Coast six days a week. A total of 14,577 lb. of mail was carried last month as compared to 9,777 lb. in July. Advertising agencies and news photo services are listed among the heaviest users of Coastwise air mail.

## Plane for West Indian Service

The West Indian Airline Express Company, Inc. purchased an American built plane of the transport type. This plane is of the twin type with three radial engines and is to be used as a mail plane in this company's projected mail and passenger service through the West Indies. It is said to be the first of a fleet of similar planes to be placed in service by this company.

## Three Deep



A line up of the Standard "Moths" at the New York airshow, England. It is noted that previously all of the three planes are already owned and the plane is a typical one of the English kind. With the exception of the plane in the foreground, the other two were made by the makers of the plane.



# Aircraft Trade Notes

## Detroit Engine Firm in Larger Factory

The Detroit Aircraft Engine Corp., builder of the Air-Cat 5 cyl. air cooled radial engine, has completed arrangements to move to its new Detroit plant during this month.

The new and larger quarters, formerly part of the Packard Liberty engine plant during the war, are located near the Dodge Motor Car Works, at 13500 30th Street Ave., at Ferry Road. The building contains 14,000 sq. ft. of space and is being completely equipped with production machinery and tools. The plant equipment includes an electric dynamometer and four large stands.

As soon as the engine corporation is able to meet the demand for the Air-Cat engine, it is planned to build up a factory stock of engines and parts for immediate shipment upon receipt of orders.

Reorganization of the corporation, following the Reuben-brother's exit, and reorganization, has been completed and the necessary reorganization has been approved by the Michigan Securities Commission. This reorganization, it is said, has been

able to keep the cost within reasonable limits without any compromise of materials or workmanship. Simplicity of design and suitability of parts for production methods have made it possible to sell the engine under one thousand dollars. The manufacturers state that a test engine has been run 100 hr. at full throttle and official government tests are now under way.

Equipment of the Air-Cat builder two Birminghams, Birmingham, Alabama, A. C. spark plugs and, if desired, Zeigler electric starter.

Among users of Air-Cat engines are: Central States Aero Co., Des Moines, Ia., to whom six engines have been delivered; Woodson Aircraft Co., Napolean, O.; Mohr's Aero Co., Minneapolis, Minn.; E. P. Hertz, Detroit, Mich.; Johnson Airplane Supply Co., Dayton, O.; and Briggs Aircraft Corp., Lansing, Mich.

The principal dimensions of the Air-Cat engine are: Bore, 4 1/2 in., Stroke, 3 1/2 in., Displacement, 200 cu. in.

In the first engine the stroke was 3 1/2 in., while the displacement was 224 cu. in. The rated horse power is 68 at 1600 rpm, and the maximum weight 218 lb. An important feature in the economy of production and of consumption. At full throttle the engine consumes five gallons of gasoline per hour, while at cruising speed this is reduced to between 3 1/2 and 4 gal. per hour. The oil consumption is 1 pt. per hour (maximum) at full throttle.

## N.A.C.A. Report on Compass Installation

A very useful technical note by M. F. Schaeffer, Bureau of Aeronautics, Navy Department, entitled "The Installation and Comparison of Compasses in Airplane" was recently published by the National Advisory Committee for Aeronautics. This paper has been prepared primarily for the benefit of the pilot who has never studied navigation and does not seem to go into the subject more deeply than to be able to fly successfully over water with confidence. It also contains data for the installation and compensation of compasses.

Copies of Technical Note No. 232, can be obtained upon request from the National Advisory Committee for Aeronautics, Washington, D. C.

## Jerome Lederer Organizes Aerotech, Inc.

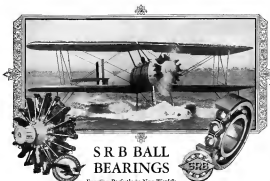
Jerome Lederer, formerly in charge of the Engineering Department of the U. S. Air Mail Service has recently organized the firm of Aerotech, Inc., aeronautical engineers with headquarters in the Murray Building, New York 24.

This company will specialize in aircraft design, design and construction, construction, airport layout and the building and development of new processes and materials for use in aviation.

It is stated that several manufacturers have already placed the services of the new organization, the work ranging from airplane design and stress analysis to the selection of new lights for airport use.

## Casper Oil Used on Cam Engine Test

In the report No. 16, test on the Fairchild Cyclone engine, Casper aviation oil was used. After a preliminary test on this oil at the Fairchild plant last October it was decided to use Casper oil for the longer endurance test. The preliminary test was for seven hours and engine was at approximately half of which was at the highest speed at which it was possible to run the engine. A report on the 56 hr. test shows that there was little vibration in the oil lubrication, oil consumption, or oil pressure, despite the fact that the engine was run day and night with varying throttle conditions.



**SRB BALL BEARINGS**

*Function Perfectly in New World's Records Established by*

## PRATT & WHITNEY "WASP" ENGINES

THE speed and altitude records established by U. S. Navy Vought "Corsair" and Wright "Apache" seaplanes, powered with Pratt & Whitney "Wasp" air-cooled Aeronautical Engines were being with SRB Annular Ball Bearings with balls forged from Molybdenum Steel.

Interesting too, is the fact that neither planes, engines nor bearings were especially designed or modified for racing.

or high altitude purposes...The SRB Ball Bearings were those from regular stock—proof positive of the fact that Quality and Performance are built into every unit.

SRB Ball Bearings find their highest performance under the severe conditions surrounding extraordinary speed and where crushing thrust and the other stresses and strains of steady "climb" result in record-breaking achievements.

Vought "Apache" seaplane powered with a P & W "Wasp" sets the world's new plane altitude record, 37,950 ft. made by Lieutenant Chapman, on July 6, 1927.

*Wasp engine set the record for the world's new plane altitude record, 37,950 ft. made by Lieutenant Chapman, on July 6, 1927.*

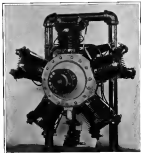
Following: April 14, altitude of 22,000 ft., April 21, 100 kilometers, 147 26 miles per hour, April 21, 500 kilometers, 216 miles per hour, May 21, 1000 kilometers, record broken with speed of 116 miles per hour.

## STANDARD STEEL AND BEARINGS INCORPORATED

Pittsburgh

USE SRB BALL BEARINGS—They last

Connecticut



Front view of the "Air-Cat" 5 cylinder air cooled radial engine mounted on the base. (Courtesy of the Detroit Aircraft Engine Corp.)

accomplished without loss to the original invention in the future engine available. Credit for the successful reorganization and the making of the corporation's success on a sound basis due to a young and energetic Detroit business man, J. Oliver Shook, now president of the corporation.

Gene D. Angle, director of engineering and sales, is well known to engineers in aeronautics whose interest dates beyond the present engine flight era. For the many references in the field it should be said that Mr. Angle is the designer and builder of the Air-Cat engine; that he is a widely recognized authority and writer on aircraft engines and formerly designed a complete year in the aircraft engine division of the Army Air Corps at McCook Field, Dayton, O.

Besides achieving a new successful aircraft engine of standard design and performance his manufacturers have been





while Mr. Windoth is the president of the Saginaw Junior Board of Commerce.

On the evening of the day of dedication, a banquet was held jointly by the Junior Boards of Commerce from all over the state and by the Michigan Aircrafters Ass'n. This turned out to be a very much worthwhile evening because of the presence of interesting speakers. Was. Mass. of Milwaukee Industrial Aircraft Corp. acted as instructor to the construction of all builds. The second speaker was Lucid Rhys, Ford of the Continental Motors Corp.

A large percentage of the Michigan Aircrafters was present and following are those registered by the instructor to the and take their turn.

"Pete" Norris, vice president of Michigan Aircrafters; Ed D. Knapp, state team dealer, his associate Dick Young, Walter Carr, Detroit Northern Michigan Airways, Inc. dealer of Dugan Aircraft Corp., Lansing; Ed Fenton, first pilot of the factory, Ben Becker and Mr. Lahti of Kalamazoo, Air Davis of Lansing, Guy Burns, state Travel Air dealer; Mr. Kitten, state Alexander Engineering dealer; Ed Kalamazoo, Orono; Ed Chas. Flint, Ted Ahrens, Hefersbrook, and others were present.

#### Greene, N. Y.

By E. E. Sargent

Charles Weather, assistant pilot at the Finger Lakes field, flying an OX5 Redhawk was first group to fly over the field recently at the aviation meeting and debarking of the new Redhawk. N. Y. flying field J. Ashcraft is a West finished model. The young personnel of the Finger Lakes field, who visited the meet and reported that the popularity of the OX5 was somewhat less than their aviation enthusiasm.

Delivery of a brand new OX5 Redhawk to E. J. Koenig, of Rochester, has been made by Tarrant and Weather. This will use this plane for commercial work and around Rochester, flying from the Longfellow Avenue field in that city.

#### Portland, Maine

The Aero Club of Maine held its fourth annual meeting and banquet recently. The club has its headquarters at Biddeford Spring field which is ten minutes by train from the heart of the city of Portland. The club has been in operation for nearly five years. The work on the new north and south runway is very nearly completed. Len Conner, flying instructor, has about a dozen students under instruction. Our latest visitor the older law was the tri-motor Pinner P-7, advertising Old Gold cigarettes. Some of the boys stayed over night at Dr. Simpson's house situated on the field. Fred Williams' Wave Two has been kept at Old Orchard field for the past three or four months.

#### Rosine, Wis.

Considerable interest was manifested at Rosine when the National School of Aviation recently moved its headquarters from Minneapolis to the Rosine airport. Robert Edward Johnson, for 14 years instructor-pilot at the Naval Air Station, Pensacola, Fla., leads the staff of instructors at the new school.

Lesson courses through the winter months will be given by R. E. Johnson and W. H. Curran, officers at the Naval Air Station, Naval Air Station. The school brought to the port has advanced students as its initial equipment.

Lesson courses through the winter months will be given by R. E. Johnson and W. H. Curran, officers at the Naval Air Station, Naval Air Station. The school brought to the port has advanced students as its initial equipment.

#### Flint, Mich.

We have been too busy flying this summer to stop to tell about it. The flying business has been good enough here so that all heads are getting on planes. Bill Chase just left for Wichita, Kan., with Harry Rogers to fly back the latter's new OX5 Travel Air. George Francis is acquiring a Wave Two in place of his Wave while Charles Kiehl is getting a Wave Three Two. Mr. Kiehl has a new Wave Two with compressed air starter which his hangar is to fly in the National Air Base in Spokane, Wash.

The demands for instruction here are on the rise. Mr. Chase has been on his string and has turned down about

## The AIRSEDAN



The Leader of the Top Flight Class

### SPECIFICATIONS:

Wing empty weight.....2100 lbs.  
Wing Span.....42 feet  
Wing Area.....1100 sq. ft.  
Length.....35 feet  
Pay Load.....800 lbs.  
Seating Capacity..... Pilot and 4 Passengers

### PERFORMANCE

High Speed (on level)..... 218 M.P.H.  
Landing Speed..... 45 "  
Cruising Speed..... 160 "  
Service Ceiling..... 14000 feet

### POWER PLANT

Wright Whetstone..... 135 H.P.  
Horsepower..... 160 to 180 H.P.  
Fuel Capacity..... 25 gal.  
Oil Capacity..... 4 gal.

### EQUIPMENT

Self Starter, Radio, Metal Propeller, Compass, Air Speed Indicator, Turn and Slip Light, Tachometer, Altimeter, Clock, Tire Temperature, Fuel Oil Pressure and Oil Temperature Gauges, Air Crops Thruster, Brakes and Tail Valve

The Airsedan is not equipped with adjustable seatbelts. Exceptional stability and control flying loads make the feature unnecessary.

Price \$12,500  
Flyaway, Our Field

**BUHL AIRCRAFT CO.**  
Marysville, Michigan

shortly. To fuel all these plans in an airport and, as the installed output of Saginaw, we hope to associate them soon.

#### Fargo, N. D.

By H. A. Lindbergh

The people of Fargo, even though they are not in the midst of aviation activities, are not content to rest while others are doing, but are enjoying and their share in a systematic manner. The Fargo Aeromarine Club, (the first of its type in the state) was organized in the spring and has a membership of about 500 at present. It has been instrumental in having the City of Fargo purchase the 160-acre field, which is to be equipped for all types of flying, within a short time.

A monoplane, manufactured by the Central States Aero Co. of Minneapolis, Iowa, and piloted by W. L. Roberts, was tested by the club in the National Air Derby as well as the National Air Races in Spokane.

The club also made Col. Charles A. Lindbergh very possible and succeeded in having Fargo designated as one of the stops on the route of the National Air Derby.

W. L. Roberts plans an air line service in connection with his aviation instruction and another school of flying is being organized, which will have its own field and hangars. Agencies for the Air King and planes made by the Central States Aero Co. are established at present in Fargo and anticipate a good future.

There are three fields in use at present in the vicinity of Fargo, one of which is generally, in the community is well supplied with landing space.

The people in this territory are more fortunate than many large communities, in that they have a field large enough to sit down at large planes at some of these mentioned and the Fargo Aeromarine Club deserves credit for its organized effort in promoting the interests of Fargo along aviation lines.

#### Madison, Wis.

Lowell Korte of Madison has purchased a Super-Standard Redhawk which he will use for passenger service in this section of the state. Edward Moran, chief pilot of the Western Airways Co., at Fresno Airport, Madison, went to Chicago recently to fly the plane back to Madison.

The Madison Aeromarine Airport committee which held its first regular meeting at the Madison club recently, appointed a committee to survey all sites about the city which could possibly be used as air fields, and also derive plans to bring air work plans in Madison.

#### Cities Provide Marking

Three cities, Baltimore, Md., Concord and Portsmouth, N. H., have provided new road marking for travel facilities.

Baltimore has its name in large orange letters on the black roof of the Fifth Street Airport which is in the heart of the city. Concord, N. H., has its name in 30 ft. white letters on a black background on a road on the north edge of the city. Orange paint is the air port on one side and Portsmouth, N. H., appears on a road in the center of that city. The letters are 8 ft. high, white on black. The word "PORT" is orange and a 30 ft. orange with an N and S at the appropriate side also appears.

#### Chattanooga, Tenn.

An agreement has been made that a commercial aviation company will be organized in this city within a short time. A group of prominent business men, including Walter Noy, nationally known engineer, discussed the question informally at a luncheon in the Chattanooga City club recently.

The aviation field in Chattanooga is named for Mr. Noy who has contributed largely to its past success.

With the 1100/160 engine type land use defined, by a vote of the people, Chattanooga is now endeavoring to set up a portion of Chattanooga Park for a landing field. This park is a government reservation adjoining Fort Oglethorpe, located nine miles south of the city.

The property is leased and that portion of the park needed for an air port is cleared of all trees and undergrowth so it was used as a picnic spot during the World War. Should this scheme fail, however, a commercial company in which practically all stock has been subscribed, will under-



Trueson, Hanger for the Fairchild Airplane Manufacturing Corp., Farmdale, L. I.

## AIRPLANE HANGARS

Trueson Airplane Hangars are permanent and fireproof. They are assembled from standardized units which can be combined into buildings of any desired length and width. Being built out in clear space, their unobstructed floor space means utmost freedom in handling ships.

### Large Sliding Doors

opening the full width of the building, simplify the storing of planes. We furnish Steel Doors for any requirements.

**TRUESON STEEL COMPANY**  
Farmdale, L. I.

Manufacturers and Distributors of Airplane Hangars

## TRUSCON BUILDINGS

for all airport requirements and for every kind of the Airplane Industry.

Send information and quotation on request.



Trueson Steel Company  
Farmdale, L. I.  
Please quote price on Hanger at below:  
\_\_\_\_\_  
Or Please send Descriptive Folder  
Name \_\_\_\_\_  
Address \_\_\_\_\_







## PUBLISHER'S NEWS LETTER

The staggering losses of the last few weeks in aeronautical ventures bring to the mind of everyone the ultimate purpose of most flying and the result it achieves. While Aviation does not, or does not print news of crashes or fatalities, it does feel that the last blow is more than just a column of sadistic statistics of a group of the finest types of pilots that have ever lived. Twenty-seven lives have been lost in the following sixteen times:

The message:  
Capt. Saint-Romain and Commander Moncey, who left St. Louis, St. Louis, May 5, for Buenos Aires.

Capt. Charles Nussimov and Major Francis Cole, who left Paris in the White Bird on May 6 for New York.

John A. Puchler, Lieut. V. R. Kopp and Miss Mildred Davis in the Miss Davis, and Jack Pratt and Gordon Scott in the Golden Eagle, who left Oakland, Calif., Aug. 16, in the Dele are due to Houshale.

William P. Erwin and Alvin H. Eshenrich, who left Oakland in the Dele Sept. Aug. 15, for Hawaii in search of the Miss Davis and the Golden Eagle.

Paul Reifers, who in the Brunswick Sept. 1st Brunswick, Cal., on Aug. 25 for Rio de Janeiro.  
Capt. Leslie Hamilton, Col. Frederick F. Winder and the Princess Anne Louverture-Windermere, who left Upson, England, Aug. 31 in the St. Raphael for Ottawa, Ontario.

Lloyd W. Bennett, James Devitt Hill and Philip Payne, who left Old Bedford, Me., Sept. 6 in Old Glory for Rome.

Capt. Terry Tolly, Lieut. James McNeill, who left Harbor Grace, N. F., Sept. 6 in the "John Carling" bound for London, England.

Those killed in aircraft flight preparations:  
Charles W. Charles and Jacob Rosenfeld burned to death Sept. 23, 1926, when Capt. Hans Frank's plane attempted to take off at Roosevelt Field for France.

Lieut. Commander Noel Davis, U.S.N., and Lieut. Stanley Wooster, U.S.N., killed May 27, when the Anconia-Lyon crashed at Langley Field, Va., on trial flight before leaving for Paris.  
Lieut. George W. E. Smith, U.S.N., and Lieut. R. S. Waggoner, U.S.N., killed Aug. 10, at Point Lemo, when their plane crashed on route to participate in Dole Derby.

Capt. Arthur V. Renny, British war ace, killed Aug. 12, at Las Vegas, during a test flight in preparation for Dole Derby.

Every one of these men would have been the first to give the act of aviation purposes through their lives. This is the reminder that actuates the men who undertake to extend the possibilities of strength by attempting what has not been done before. We feel that Mr. Henry Guggenheim has

struck the right note regarding these flights. He states:

"Indeed, these gallant pioneers, Nussimov and Cole, and others whose bodies lie in the Atlantic and Pacific, have not died in vain for their efforts have taught a lesson which will be a source of safety to those who will follow. The public was skeptical, has always been skeptical of aviation. And the men who have succeeded as well as those who have failed in making spectacular flights have turned the public skepticism into confidence, and the fact that these have been failures has not even greater value to the aviation."

"The public, a new kind of aviation, its imagination has been profoundly stirred; the people of the whole world now realize that aviation is perfectly practical but like other means of transportation depends for its safety on a combination of skill and operation and maintenance of equipment. Everybody knows that aerial vigilance is the price of safety in railroading, automobile and sailing. We now realize that the most aerial vigilance means safety in aviation."

"The extremely important objective now is to make flying not only safe for the conservative flyer but to make it as nearly as possible fool-proof. When this has been achieved flying should become as generally popular as swimming. The French has expressed a wide acrony coinciding with the sharp of having close the day of the 'Yard' phase. The rules of this contest have been drawn in consultation with greatest aeronautical experts in all parts of the world."

"State flights should be discontinued and no less discouragement should be demonstrated against the offering of prizes for aviation contests, the principal purpose of which is publicity, and where the chief risks are not taken by those offering the prizes. There is a great field for aviation here factors in facilitating the construction of new and better equipment which will mean real aviation progress."

From our own personal standpoint, the impossible part to the world is the loss of some of the most skilled pilots who ever grabbed a joy stick. In war and in peace they have devoted their talent and ability to flying. They have done their share to demonstrate the reliability of flying for many years. But they wanted to do more. They hoped to be able to fly planes over the uncharted seas. With sorrow in the hearts of every aviator in the country, for every one in aviation knows some or many of the men who have lost their lives, it is difficult to take the point of view of a few years hence. But that will be the comforting side, perhaps the only compensation, that these men and women did point the way, that they did have the vision, and when their names are remembered in the days of the aerial war ahead it may then be said that they did not die in vain.

## AUSTRALIA

We are prepared to negotiate for the following—

The Australian manufacturing rights (royalty basis) of aircraft and spare parts of aircraft engines, stores and sundries equipment.

### We Are Contractors To :-

Royal Australian Air Force.  
(Revolving aircraft, maintenance of spare parts and supply of stores).

### Civil Aviation Department.

(Maintenance of aircraft, maintenance of spare parts and supply of stores, repair and overhaul of aircraft etc.).

### Australian Aerial Services.

(Maintenance of aircraft, maintenance of spare parts and supply of stores, repair and overhaul of aircraft etc.).

### Works & Railways Department.

(Maintenance of aerodromes, light aircraft spare parts).

Address complete specifications, prices lists and latest reports to:-



510-512 CHURCH STREET, MELBOURNE, AUSTRALIA.

## 2nd AIR-CAT



America's Fine Commercial Aircraft Engine

The Duxton Air-Cat is a modern development of 400 hp. ideally suited for the engine of the private owner.

Write for Particulars.

CLEON D. ANGER

Director of Engineering & Sales

DETROIT AIRCRAFT ENGINE CORPORATION  
MT. ELIJAH & LYNCH RD. DETROIT, MICH.



## "For Safety in the Air — Everywhere"

IRVIN AIR CHUTES have been developed to their present high state of efficiency by several years of the most extensive scientific research and tests.

IRVIN AIR CHUTES have saved the lives of over 25 aviators in various parts of the world in emergency covering practically every form of aircraft accident.

IRVIN AIR CHUTES are the standard life-saving equipment for all Air Forces of the United States, Coast Guards, and many other Governments.

Illustrated Brochure on request.

## IRVING AIR CHUTE COMPANY, INC.

312 MAD ST., BUFFALO, N. Y.

Cable Address: "Irvin Chutes N. Y. U.S.A."

## THE REED PROPELLER

(Patented)

With solid blades made from forged or rolled aluminum alloys of the Duxton type.

Over 2000 in Service

In production by Licensees in the United States and principal foreign countries.

113 E. 55th., NEW YORK, N. Y.

## PERRY-AUSTEN

Acetate Dopes Clear Pigmented

## PERRY-AUSTEN CLEAR ACETATE DOPES

The Lasting Undercoat

The Best Finish { Undercoats—For Clear Acetate Undercoats—For Pigmented Dopes

Perry-Austen Mfg. Co., Station Island, N. Y.  
Contractors to United States Government













AIRPLANES

## *“Going Over Big”*

**T**HIS is the title of a new piece of illustrated literature, just off the press, that we want you to see. Write for it, it's FREE.

“Going over big” illustrates and describes Air-King's welded steel, seamless tubing fuselage; adjustable, horizontal stabilizer; split axle type undercarriage; welded-in flying wire fittings and the many more special refinements that make “Air-King” such an outstanding example of airplane design and construction.

The Air-King Airplane can quickly be converted into an efficient seaplane by the use of Edo Pontoons.

— — —  
**NATIONAL AIRWAYS SYSTEM**  
**FIELD 7, LOMAX, ILL.**